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THE ELEVENTH ANNUAL CONVENTION OF THE A.R.B.A.

With the Eleventh Annual Convention held at Chicago during the week beginning on the 14th of last month, the American Road Builders' Association again scored a remarkable success. From whatever standpoint viewed, the meeting was not only the most successful of a long line of successful conventions under the same auspices, but it undoubtedly surpassed in interest and attendance any similar meeting ever held in this country or elsewhere.

That success did crown the efforts of those in charge of the undertaking is all the more noteworthy in view of the somewhat unfavorable conditions under which the affair was conducted. In the first place, a business situation that is far from satisfactory might reasonably have been expected to exert its influence to the detriment of the exhibition. On the contrary, the show feature at Chicago far surpassed all previous efforts in that line. In the second place, the convention as was the case last year, followed almost immediately after another road meeting at which there was a comparatively large attendance and which also included an exhibition. To a considerable extent, both meetings drew their attendance from the same general source and depended upon many of the same experts for papers and discussions. Both exhibitions, of course, depended for their support upon road and street machinery and material manufacturers and dealers. In spite of these apparent handicaps, the A. R. B. A. convention and show did not, it would seem, suffer in attendance, quality of proceedings or number and variety of exhibits. Lastly, the A. R. B. A. had to contend with most discouraging weather conditions. It was very cold during the week of the convention, and the zero weather that prevailed a part of the time undoubtedly resulted in a smaller attendance from points near Chicago than there would have been had the weather been less inclement. The same cause and the distance between the hotel district and the International Amphitheatre—the only place in Chicago where such an exposition as the Sixth Good Roads Show could have been held—no doubt deterred many who had come to the city from making as many trips to the convention and show as they would have made under pleasanter conditions.

The technical proceedings of the Chicago convention were on the same high plane as those of the A. R. B. A. conventions at Philadelphia, Cincinnati and Rochester. Moreover, the makers of the program departed from the usual manner of arranging the meetings of road congresses. Instead of the usual long series of papers and discussions designed to cover the entire field of highway work, with the resulting repetition of elementary matter, the program embraced a relatively small number of papers, each of which, however, dealt with some especially important problem of organization, construction or maintenance. Each of these papers was prepared by a man well qualified by training and experience to treat his subject, and in most cases the authors were present to read or summarize their papers and to take part in the very interesting and instructive discussions which followed the presentation. As much can not always be said of the proceedings of meetings devoted to technical subjects. After the presentation of each paper the subject was discussed by several especially selected speakers and the discussion was then thrown open to the meeting—the plan followed at previous A. R. B. A. conventions.

If any unfavorable criticism were to be made, it would be that more time might well have been allowed for these open discussions, for they constitute what is the most profitable part of the technical proceedings. At the same time, it is realized that with so much ground to cover and with the time at their disposal so limited, the program committee did very well, indeed, to make the program as comprehensive as it was.

An unprejudiced observer who attended the Sixth Good Roads Show at Chicago would have no hesitancy in pronouncing it the most comprehensive and diversified display of its kind ever assembled anywhere—as well as the largest. A record was made at the Philadelphia convention of the American Road Builders' Association in 1913 when one hundred commercial exhibitors were brought together at the First Regiment Armory. But at the International Amphitheatre in Chicago last month, there were 108 commercial exhibitors, and in addition, the show as a whole was far more impressive. The excellent facilities at the Amphiteatre for the installation and display of heavy and bulky exhibits made it possible to assemble an unusual collection of the heavy equipment used by contractors and others in the construction and maintenance of modern roads and pavements. In addition it was feasible to show much of the machinery in actual operation—an advantage that was appreciated by many of the exhibitors who improved the opportunity to demonstrate their equipment to those interested.

No review of the show would be complete without reference to the model boulevard in the arena, which was certainly the most novel, and, in the opinion of some, the most interesting feature of the exhibition. The arena is situated in the center of the exposition building and is about one hundred feet wide, north and south, and approximately two hundred and twenty-five feet long, east and west. The educational exhibits were arranged around the outside of the arena and inside of them an area about ten feet wide was laid off for a sidewalk and covered with crushed stone of small size. Next to this promenade was built the model boulevard, twenty feet wide, which is described in detail elsewhere in this issue. Two walks similar to the walk between the booths occupied by the educational exhibits and the pavement were built, intersecting at right angles and dividing the area enclosed by the pavement into four portions, which were studded with small evergreen trees. Poplar trees were set up around the outside of the pavement, and at intervals were placed ornamental light standards surmounteded by brilliant electric lights. The decorative scheme was completed by a fountain placed at the intersection of the longitudinal and the transverse walks through the center parking. A photograph that does not do full justice to the arena is reproduced on another page.

The attendance at the convention was all that could have been expected and, in spite of the handicaps referred to earlier, exceeded by several hundred that at Philadelphia in 1913, which was the largest ever registered at a road convention up to that time. So far as is known, the Chicago registration establishes a new attendance record for road conventions and emphasizes once more the drawing power of the meetings organized by the A. R. B. A. Moreover, the attendance was no more noteworthy on account of the number than in regard to its character. As has been noted in these columns before, the American Road Builders' Association holds conventions which depend for their attendance upon the men who are actually and actively engaged in road and street work—not, as is the case with so many road organizations, upon those who have no direct connection with highway work, but who are interested merely as road users or in some less direct way. Those who come to the conventions come for very definite purposes—to learn what they can and to meet the men who are engaged in the same line of work. These men are the officials and engineers of state, county, township and city road and street departments, contractors on rural road work and city paving, expert highway engineers and chemists in private practice, the road and street machinery and material manufacturers and dealers, and others who have a practical and vital interest in road and street work.

Another point worth noting in connection with the convention is that not only was there a large registration, but there was also a uniformly large attendance at the technical sessions. At almost every session the number present taxed the capacity of the meeting place, although it accommodated many more than can usually be counted upon to be present at purely technical sessions.

Taking into account all the factors entering into the success of road conventions, there is no question whatever that the Chicago convention stands out among meeting of the kind. The American Road Builders' Association is to be congratulated upon its achievement.

Graduate Course in Highway Engineering at the Iowa State College.

An eight-weeks' graduate course in highway engineering will be given at the Iowa State College, Ames, Ia., during the period from January 4 to February 27, 1915. The work of the course, according to the official announcement, will be of an advanced character, suitable only for men who are technical graduates or who have had equivalent experience, and the subjects will be presented from the standpoint of the engineer on city work and that of the engineer engaged in rural road work.

The subjects have been arranged in groups so that a portion of the work may be completed by men who are unable to stay long enough to take the entire course. The subjects to be taken up, together with the time in the course at which each is scheduled, are as follows:

1. "Theory and Practice of Road and Pavement Design," daily lectures and drawing room assignments, first and second weeks.
2. "Auditing, Accounting and Cost Keeping," daily lectures and assignments, third and fourth weeks.
3. "Highway Bridge Design," four lectures and two drawing room periods per week, first four weeks.
4. "Non-Bituminous Materials Testing," daily laboratory work, fifth and sixth weeks.
5. "The Preparation of Highway Specifications," daily lectures and assignments, fifth and sixth weeks.
6. "Construction Methods for Road and Pavement Surfaces," daily assignments and lectures, seventh and eighth weeks.
7. "Bituminous Materials Testing," daily lectures and laboratory work, fifth, sixth, seventh and eighth weeks.
8. "Highway Legislation and Administration," daily lectures, last four weeks.
9. "Management Engineering," daily lectures and assignments, eighth week.

The charges for the course will consist of a registration fee of $9.00, a fee of $2.00 for the non-bituminous road materials laboratory, and a charge of $3.00 for the bituminous materials laboratory.

The Widening of Main St. in Fort Worth, Tex., has recently been authorized by the City Commissioners. According to the present plan, a portion of the street will be widened from 50 ft. to 100 ft. for the purpose of relieving the congestion of traffic on the Jennings Ave. viaduct.

Fifth American Good Roads Congress and Eleventh Annual Convention of the American Road Builders' Association

The Fifth American Good Roads Congress, Eleventh Annual Convention of the American Road Builders' Association and Sixth Good Roads Show were held at Chicago, Ill., on December 14, 15, 16, 17 and 18, 1914. The total registration, which was upwards of 3,500, included representatives from practically every state in the Union, a number of the provinces of Canada and several foreign countries. The registration was the largest of any road convention of which there is record and included by far the largest number of actual road builders ever gathered together at any convention in this or any country. These road builders included state, county, town and city officials, contractors, machinery and material manufacturers and dealers and others directly connected with road and street work.

The meetings began on Tuesday afternoon, December 15, this session—the first—being devoted to addresses of welcome, the response on behalf of the American Road Builders' Association, the presidential address and other addresses. In the evening a meeting was held under the auspices of the Associated Roads Organizations of Chicago and Cook County. The technical meetings commenced with the second session, on Wednesday, December 16, and were continued through the third session on Wednesday afternoon, the fourth session on Thursday morning, the fifth session on Thursday afternoon, the sixth session on Friday morning and the seventh session on Friday afternoon. All of the sessions were held in the assembly room of the Saddle and Sirloin Club in the Stock Yard Inn.

On Wednesday evening the annual banquet of the A. R. B. A. was held in the Grand Banquet Hall of the Hotel La Salle. This year a vaudeville entertainment was added to the program, and the after-dinner speeches were purposely limited in number, as it was the idea of those in charge to make the entertainment feature the predominant one.

The Sixth Good Roads Show comprised exhibits by over one hundred exhibitors, nearly all of whom were manufacturers of or dealers in road and street building machinery or material. The commercial exhibits were divided into two classes—those consisting of machinery and those consisting of material. The former were housed in the South Pavilion of the International Amphitheatre and the latter in the North Pavilion. The educational exhibits were arranged around the arena in the International Amphitheater. In the arena itself was a paved road, 20 ft. wide and nearly 500 ft. long, consisting of sections, each from 20 to 40 ft. long, built of different materials or by different methods. This roadway was bordered by trees and sign posts, and lamp posts were set up at intervals, giving it all the appearance of an actual street.

An account of the Sixth Good Roads Show is printed on other pages of this issue. The report of the sessions follows.

Monday, December 14.

The only event of the convention on Monday was the formal opening of the Sixth Good Roads Show early in the evening. President McLean made the speech of the occasion, referring briefly to the development of the association since its organization and comparing it with the growth of the good roads movement. He also announced that he had been in telephonic communication with the city officials and that although Mayor Harrison was unable to be present he wished to convey to the American Road Builders' Association assurances of his interest in its objects and to extend a welcome on behalf of the city.

Tuesday, December 15.

FIRST SESSION, 2:30 P. M.

The first session was called to order at 3 p. m. on Tuesday by President W. A. McLean. After an invocation by the Rev. J. P. Stafford, of the Union Avenue Methodist Church of Chicago, President McLean called upon Commissioner of Public Works L. E. McGann, of Chicago, who extended the welcome of the city on behalf of Mayor Harrison, who was unable to be present.

At the beginning of his speech Commissioner McGann conveyed Mayor Harrison's regret at his inability to be present, presented the Mayor's compliments and extended to the convention the Mayor's wishes for the greatest possible success. He referred to the economic necessity of good roads and deplored the sectional divisions which hinder the betterment of the roads in accordance with a harmonious, comprehensive plan. He said that Chicago had suffered from this, as the aldermen of each ward would work for the welfare of that one particular portion of the city without regard to the improvements in adjoining wards. He said that during 1914 city officials had planned a through route or through system of roads leading out into the surrounding country, and that the local roads associations were entitled to a great deal of credit for their aid in this work. He predicted that in another year the city would be greatly improved, adding that he considered that the improvement in the past two years had been greater than in any similar period in the last ten years. In closing, he congratulated the American Road Builders' Association on coming to Chicago, referred briefly to the conditions and needs in Chicago and extended the welcome of the City.

A. D. Gash, President of the Illinois Highway Commission, spoke next, welcoming the convention to the State of Illinois. President Gash, who spoke as the representative of Governor E. F. Dunne, of Illinois, spoke first of Governor Dunne's interest in good roads and to the work done by the Governor on "good roads day" last April, when he made a trip from Chicago to Springfield, during which he made between twenty-five and thirty speeches. Governor Dunne, he said, has been one of the chief exponents of road improvement in Illinois, having championed the passage of the road law enacted by the last Legislature. President Gash then reviewed the road situation in Illinois, briefly outlining the history of the good roads movement, the passage of the present law and the litigation which resulted in the Supreme Court decision upholding its validity. In referring to the work done by the State Highway Commission in mapping out the road system, he said that when the roads were constructed there would not be a farmer in the state who would reside further than 4½ miles from an improved main road. He expressed the belief that the improvement of the main system would stimulate the improvement of the lateral roads. Referring to the financial aspect of the problem, President Gash said that the cost of building the 16,000-mile system would amount to $180,000,000, which would be less than $30 per capita. In closing he referred to the age of the good roads movement and of the value to road builders of discussing the various problems of their art, and expressed his pleasure in welcoming the congress to Illinois.

The next address was made by Assistant Superintendent of Schools John D. Shoop, who extended the welcome on behalf of the Chicago Association of Commerce, of which he was the representative. One of the greatest functions of good roads, according to Mr. Shoop, is to bring the people of different parts of the country into closer and more sympathetic relations. He expressed the belief that had lines of communication been as well established between the North and South as between the East and West one of the greatest calamities in the history of the nation might have been averted. He also expressed the belief that the gospel of good roads would help to relieve the present economic tension and aid in solving the problem of the high cost of living. He dwelt at some length upon the necessity for good roads from an educational point of view, pointing out the necessity for good roads between the homes and the schools.

President McLean, of the A. R. B. A., spoke very briefly in response to the addresses of welcome, thanking the City of Chicago, the State of Illinois and the Association of Commerce for the welcomes which they had extended. He also referred to the growth of the City of Chicago and its present importance, saying that he believed that it was due more to its location with regard to transportation than to any other cause. President McLean said that it was customary for the President to introduce the proceedings by something of the nature of a serious talk, but that the time was passing and that as the paper which he would have presented was in print and would be available he felt sure that under the circumstances the convention would permit him to pass it over as having been presented to the convention in the usual way.

The presidential address to which President McLean referred follows:

ROAD IMPROVEMENT

By W. A. McLEAN

Commissioner and Chief Engineer of Highways for the Province of Ontario, Canada

Presidential Address

The present era is remarkable as one of rapid and convenient travel, transportation and communication. In this it is distinguished from all preceding ages. Invention has shown more marked advance in this phase of modern civilization than in any other. Every refinement has been sought, and vast expenditures have been made on steam and electric railways, ocean and lake steamship lines, harbors and canals, express, postal, telephone, telegraph and cable services. The motor vehicle is becoming a necessity for the transaction of business and even the air has been conquered as a practical medium for human locomotion. All these have not lessened but rather have increased the need for better common roads, and the demand for their improvement is accumulating with marked intensity.

The road situation of today presents many problems. It is doubtful if road conditions will ever be without their problems, for changes are constantly taking place, requiring an equivalent adjustment in methods of dealing with them. But it is also true that the present generation has opportunity to advance in this regard far beyond reasonable heritage or desires—for in general common road construction has been neglected, has been sidetracked and forgotten in the hurry of railroad construction.

New demands are pressing; advanced methods of construction are needed; old systems of organization are inadequate; old abuses and prejudices are persistent; opportunity for reform and progress is abundant and urgent.

The work of this Association, and particularly that of the annual convention, is to its active members a matter of continuous but ever-reviving interest. Until the last ten or fifteen years, road construction in the open country was well served by water bound stone and gravel, and was governed by established practice. Roads were built for horse-drawn traffic only and the weight of loads was comparatively light. With the general use of rapid motor vehicles an entirely new form of wear has been added to that of steel tires and steel-shod horses; the weight of loads has largely increased, placing a much greater demand on road foundations and on bridges; the use of roads has greatly increased, especially on highways carrying suburban and interurban traffic. Road building is in a reformative stage, and the annual accumulation of experience is steadily shedding new light on a very complex problem.

The growing difficulties of road construction and maintenance are not without their reward. The increased *use* of the roads means their increased *usefulness*. The possible service that may be performed by the common road is in proportion to the efficiency of the vehicle. The motor passenger vehicle and the motor truck have greatly advanced the general public value of the common road; and whereas good roads were regarded, a few years ago, as solely of rural concern, urban centers have become keenly alive to their value, and are willing to bear a fair proportion of the cost. The value of roads as a means of travel and transportation has increased manyfold. Instead of the farming population being expected to meet the entire cost, it is now fully conceded that, as regards main roads, cities must share the *burden as with any other* department of transportation.

Correlation of Facts

The number of elementary materials used or dealt with in road making is strikingly few, and, with minor exceptions, these materials are included in a brief list—sand, clay, gravel, broken stone, asphalt, tar, oils, vitrified brick, creosoted wood, stone setts, and Portland cement.

To these may be added a few materials of local service such as oyster shells; or proprietary binders, such as Rocmac or Glutrin. While the elementary materials are few in number, the range in quality is wide, their combinations are many, conditions of traffic are of varying degree, and such factors as climate, workmanship and cost must be considered.

In the solution of road problems, at the present time, effort should be largely given by scientific engineers to the accumulation of facts respecting road materials and their action under climate and traffic. Much has been done in the past five years in this regard, and it is confidently expected that the next five will do more. Experience will then more nearly approximate the anticipated life of new materials and new methods. The status of knowledge respecting road construction in the next five years will largely depend on the care and thought with which we, at the present time, assemble and correlate obtainable facts. This is a matter which should be especially impressed upon municipal bodies, and cooperation with their engineers obtained, in order that experiment, test, and the collection of data may be effectively carried out.

Roads should be built according to traffic. To a proper solution of the problem of road construction and maintenance, there is much need of the general acceptance of uniform traffic standards. Traffic, in relation to the results from a paving material, is sometimes loosely described as "light," "medium" or "heavy." These terms have all grades of meaning according to locality. In one district 200 vehicles a day would be considered heavy traffic, while in another 2,000 vehicles might be medium traffic. When traffic standards have been clearly defined, and data is accumulated as to behavior and cost of a material under definite degrees of traffic, our experience can become of much greater usefulness. What is needed is a greater accumulation of fact, correlated with definite standards of traffic.

Work Should Not Be Delayed

Road building is a slow process. In the northern states and Canada there are only about one hundred actual days in the year to be fully depended on. A mile a month for six months of the year is reasonable progress for one outfit of machinery.

There are limitations as regards labor and material which cannot be exceeded without greatly increasing the cost of the work. If a community needs a good general system of roads today the work should have been commenced twenty years ago. If a system is needed twenty years hence, it should be commenced now.

Permanent Roads

The term "permanent" as applied to roads is somewhat misleading, and is not always appreciated by the general public. In the full sense of the word, there is no such thing as absolute "permanency." It is merely a relative term. But it is important, in making safe provision for financing road undertakings, that the matter be clearly understood. For all practical purposes, expenditure for the purchase of road allowance may be regarded as permanent; earthwork and certain drainage of an adequate kind may be regarded as permanent; substantial concrete culverts and bridges may be regarded as permanent; heavy road foundations may be permanent. But there is no such thing as a permanent road surface. Traffic and natural disintegration cause the wear and decay of any road surface that can be employed, and adequate provision should be made for the repair and renewal of the surface.

To meet the immediate needs of traffic throughout the United States and Canada, a large amount of construction must necessarily be carried on that cannot be considered of a "permanent" kind. To attempt the task of immediately building, for all traffic, roads that would have a maximum of permanence would be as impossible as it would be economically unwise. A large part of the farm traffic can, for the present, be best served by roads of moderate cost, lightly surfaced with broken stone or gravel, but carefully graded and drained. In many localities even good earth roads (but well graded and drained) maintained by use of the log drag must be depended upon to meet the needs of traffic, owing to sparse population or the absence of local gravel, stone, or other suitable surface material.

The most unfortunate results have, however, arisen in the treatment of main roads on which, though expensively built, an effort has been made to maintain a heavy bituminous or other high-class surface on a totally inadequate foundation.

Much discussion has taken place during the past year on the subject of road foundations, and has arisen largely from those who attended the International Road Congress in London last year, as a result of their observation of practice in Great Britain and in Europe. European practice in all classes of permanent road construction has undoubtedly in the past tended to greater mass in the foundation than has been generally adopted on this continent. If past practice abroad has proven the need for the massive foundation, it would seem that, on this continent, the use of light foundations should be critically considered, with a view to the adoption of a greater depth of stone and the more general use of Telford or equivalent foundations, particularly for main roads, on which heavy traffic is assured. In the construction of strong foundations there is opportunity for permanency, which will at the same time reduce the cost of repair, for a large outlay may readily arise from attempts to maintain a good surface on an insufficient and yielding foundation.

Fair Distribution of Cost

A fundamental necessity in creating a system of roads is that the cost shall be fairly and equitably levied on those who benefit. Failure to do so has done much to retard road building in the past. If the general public feels that the cost of roads is borne in a reasonable degree by those who should contribute, much opposition will vanish. If the farmer feels that he is being asked to build roads for motorists of the cities, he is naturally opposed to proposals for road development on such a basis. Out of this has grown much of the opposition in some localities to the construction of trunk and state roads. A close study of the farmer's viewpoint by advocates of trunk roads will throw light on the road situation as a whole, and will indicate that a successful road policy in any province or state should make provision for the improvement, if not of all roads, at least of those more directly serving farm traffic. Broadly, trunk roads run from city to city, and are commonly parallel to the steam railway. The market roads, on which rural traffic most frequently concentrates, radiate from the stations, villages and shipping points, and are, in general, at right angles to the trunk roads so often advocated for motor traffic.

Trunk roads are a necessary adjunct of any system of roads. They are desirable, and should be built. They frequently form part of a system of local market roads, but must be more substantially built to serve the more severe traffic.

It is difficult, however, for even the most patriotic farmer to rest satisfied with beautiful pictures and illuminative newspaper descriptions of the splendid roads of his own state—roads he never sees—while he has still to drive through the mud axle-deep to his local market or shipping point, with nothing being done to remedy that condition. Rural residents of every good farming community want good roads, and are willing to meet a reasonable outlay for them—nor are they opposed to trunk roads if the cost is levied upon the proper source.

A farming community, in so far as is consistent with its prosperity, can fairly be asked to contribute such amount per mile of road as would properly meet the needs of local traffic. For more expensive construction for motor traffic the remainder of the cost should be met from a source representing the contribution of cities or other communities benefited.

Market roads without trunk roads are commonly opposed by cities quite as much as the farmers oppose trunk roads when provision is not made for market roads. Upon a plan of road improvement which includes both, all the people can agreeably unite.

It is not intended to convey the impression that all roads can be built at a stroke, and that a durable road can be at once built to every farmer's gate. There must be a starting point. For this purpose certain roads must be selected for the immediate improvement, others to take their turn later. A study of local traffic conditions will indicate the roads on which traffic seeks to concentrate, and, commencing with these, the general system can be developed from year to year.

There should be no conflict of interest between the two classes of roads. The one is a necessary adjunct of the other in a complete system of roads. The great need is that the value of both should be recognized and adequate measures taken to develop both concurrently; but there should be no effort to substitute one for the other.

Bond Issues

Much difference in opinion and practice exists with respect to the issuance of bonds for road construction. At one extreme are those who oppose all bonded debt for public roads, while at the other are those who advocate bonds maturing in forty and fifty years. It is probable that, as in most cases of widely divergent opinion, the true solution is in a moderate middle course.

The primary construction of a great system of roads has, in all countries, required large initial expenditure, such as can only be procured by distributing the repayment over a term of years. The construction of main roads, and even good market roads, is as a rule carried on in very disjointed sections, and at a sacrifice of workmanship, if the cost is provided by annual levy only. The necessary initial outlay can, as a rule, be sustained only by borrowed funds.

It may be asserted as a further truism that the term for retiring the bonds should not exceed the useful life of the work. Again, repayment in the briefest possible period is favorable in that the total interest charges are reduced.

In considering the matter, the road structure may be divided into several portions:

(1) The system of drainage;
(2) The earth subgrade;
(3) The foundation;
(4) Bridges and culverts, and
(5) The wearing surface.

Judging the future by past experience, it may be estimated that long-term bonds for certain portions of the work are justifiable. An effective system of open and underdrains, deep cuts, extensive fills, and an adequate width of earthwork; a Telford, concrete or other heavy foundation; concrete or heavy steel bridges and culverts are all of long durability, and may justify long-term debentures. The road surface, on the other hand, has a comparatively short life, and will seldom justify a debt of more than five or ten years' duration. Adequate maintenance is in all cases essential.

The methods of finance as regards the issuance of bonds may thus be based on the life, not of the surface only, but of the several portions of the structure; the bonds for surface costs to be retired in not more than five or ten years, while the long-term period may be applied to what may be more truly termed the "permanent" portion of the work.

It might be logical to approach the matter on the basis of a general estimate, meeting a proportion of the cost, approximately 50 per cent., by long-term bonds, the remainder, or 50 per cent., covering surface costs, to be retired, according to the life of the pavement, in from five to ten years.

To go even further on the ground of safe finance, and to pay something for immediate benefit, a portion of the cost might be met out of the annual levy; but that as a rule is difficult, and may tend to reduce the amount available for adequate maintenance. It need not be added that to meet the cost of maintenance by the issue of bonds should be regarded as a criminal method of finance.

Town Planning

Town planning is a matter with which road builders, we believe, should be closely identified. In this let us not be misunderstood. By "town planning" we do not mean the preparation of artistic plans and beautifully imaginative reports frequently employed for municipal advertisement and the promotion of speculative subdivision schemes.

The essential principles of town planning are largely based on adequate provision for present and future traffic requirements, together with subordinate matters of street and road design.

The question of town planning is one which should arouse interest in every progressive town and city. The United States and Canada are passing through a period of growth and expansion which, we trust, may long continue, and proper foresight in this regard is a necessity.

The past tendency to allow towns and cities to follow unguided growth has resulted in many objectionable and unfortunate conditions which could readily have been avoided, but which may now only be remedied at much expense.

The Housing and Town Planning Act of England, a recent measure, is accomplishing much, in enabling landowners and municipalities to enter into agreements for mutual benefit. Main and radial thoroughfares are provided, parks and open spaces are laid out subject to agreement, industrial areas are set apart, residential districts are fixed, and streets, drainage, grades, water supply and many other details are decided upon in a manner that gives every opportunity for favorable and least expensive growth. The advantage to both the public and the landowner is apparent.

No doubt many towns and cities on this continent, now comparatively small, are destined to a very considerable growth, and by well-devised measures, the gradual widening of existing streets, the opening of new streets, grouping of public buildings, etc., could be provided for; so that town planning may be applied not only to new areas, but to the favorable treatment of old districts and the removal of existing defects. Practical town planning is of much value in meeting the present and future traffic needs of urban communities.

Present Financial Influences

The influence of the war on the financial situation is a feature of much importance as regards the present and immediate future of road building on this continent. On the declaration of war by European powers in August last, while much uncertainty was felt, there was remarkable freedom from panic in the money markets of the world. Since the commencement of hostilities there has been a decided improvement. Crops, on the whole, in the United States and Canada have been good, and farmers are receiving good prices for their produce. While the flotation of municipal bonds is difficult, and capital is showing a natural timidity, there is a growing tone of optimism which promises much.

While municipalities and state governments of the United States are feeling the effect of war conditions, Canada is more directly influenced, and is, at the same time, meeting a heavy war expenditure.

The borrowing opportunities for Canadian governments are restricted, and while loans for large undertakings are seriously handicapped, means are being developed through local capital to meet necessary and desirable outlay.

The construction of roads for war relief has been largely accepted as a logical measure, and while rural municipalities, with a continuance of good crops and prices, will be in an excellent position to carry on the work, the ability of provincial governments to aid large undertakings may not be correspondingly favorable. Here private capital has, in at least one marked instance, stepped into the breach, and the construction of a concrete highway from Toronto to Hamilton (about 40 miles) has been organized and commenced since September 1st. A proposal to construct a main road from Montreal to Windsor, across the Province of Ontario (over 500 miles in length), as a great memorial to the Canadian expeditionary forces, has been received with much public favor, and it is not improbable that construction may be commenced as a war relief measure.

The final effect on road construction must largely depend on the duration of the war. Should the struggle, with its tremendous waste, be prolonged for three years, as is predicted by an eminent authority, the ultimate influence on financial conditions is impossible to estimate. Should it be concluded in a year, as many hope, the present feeling of optimism will assuredly not be without substantial foundation.

At the close of his remarks, President McLean introduced as the next speaker Finlay G. MacDiarmid, Minister of Public Works for the Province of Ontario.

After expressing his appreciation of the privilege of addressing the convention and referring to the pleasant relations between Canada and the United States, Mr. MacDiarmid sketched briefly the needs of Ontario as regards road improvement and outlined some of the work proposed in that province.

President McLean next introduced Mayor H. C. Hocken of Toronto. In his address Mayor Hocken laid particular emphasis upon the improvement of roads as a matter of service, pointing out that it is the duty of the government to make it possible for every class of community to give to every other class of community absolutely the full measure of service of which it is capable. He also referred to the value of conventions in giving delegates ideas to take back with them.

Mayor Hocken was followed by Mayor Martin Behrman of New Orleans. After referring to the conditions which had made progress difficult in the South since the Civil War, he told of the highway work which is being done there now especially in New Orleans. He touched upon various aspects of the good roads problem, especially the necessity of bringing the people of the city and country nearer together and the need for making farm life more attractive.

The last speaker of the session was Chairman William D. Sohier of the Massachusetts Highway Commission. Chairman Sohier's remarks dealt principally with administering and financing road work. He pointed out the necessity for retaining competent engineers in office and of eliminating politics from highway affairs. He said that he knew that the results which had been obtained in Massachusetts had been due to the engineering force in the department, continuity of office in the commission and the force of public opinion. He said that the states are appropriating money faster than they can use it economically because they cannot get men who know how to spend it. He also referred to the issuing of bonds to pay for road improvement, and called attention to the necessity of providing at the same time for maintenance, advocating the placing of the maintenance work under the control of the state instead of the local authorities.

At the close of Chairman Sohier's address, President McLean announced the personnel of the Committee on Resolutions, as follows: Chairman, Nelson P. Lewis, Chief Engineer, Board of Estimate and Apportionment, New York, N. Y.; Paul D. Sargent, Chief Engineer, Maine State Highway Commission; Major W. W. Crosby, Consulting Engineer, Baltimore, Md.; A. W. Dean, Chief Engineer, Massachusetts Highway Commission; A. R. Hirst, State Highway Engineer of Wisconsin; Dr. Joseph Hyde Pratt, State Geologist of North Carolina; T. H. MacDonald, State Highway Engineer of Iowa; James H. MacDonald, formerly State Highway Commissioner of Connecticut, and S. D. Foster, Chief Engineer, Pennsylvania State Highway Department.

EVENING SESSION

On Tuesday evening a meeting was held at the Hotel La Salle, following a dinner arranged by the local road and street officials and road organizations. William G. Edens, President of the Associated Roads Organizations of Chicago and Cook County, presided, and introduced as speakers Mayor Carter H. Harrison, of Chicago; Mayor H. C. Hocken, of Toronto, Ont.; Mayor Winn Powers, of St. Paul, Minn.; W. A. McLean, President of the American Road Builders' Association; Nelson P. Lewis, Chief Engineer of the Board of Estimate and Apportionment, New York, N. Y.; Richard J. Finnegan, Secretary of the Illinois Highway Improvement Association, and City Editor of the "Chicago Evening Journal;" Frank Terrace, of Portland, Ore., a delegate from the States of Oregon and Washington; A. D. Gash, President of the Illinois Highway Commission, and James H. MacDonald, former State Highway Commissioner of Connecticut. About five hundred were present at the meeting.

In introducing Mayor Harrison, Mr. Edens spoke of the cooperation of the officials of Chicago in making the affair of the week a success, and mentioned the construction done on Sheridan Road, an up-to-date boulevard connecting Chicago and Milwaukee, Wis. He told of the plan of the Illinois commission for 20,000 miles of state aid road in the state. He stated that during Mayor Harrison's administration more had been done for the improvement of city streets than had been done under any mayor in the history of Chicago.

Mayor Harrison began his remarks by stating that for many years he had been an advocate of good roads. He said that he was an enthusiastic bicyclist twenty years ago and was a member of the League of American Wheelmen and other clubs. He told of riding 5,000 miles on his machine in 1896, and stated that this experience had taught him the value of good roads. When he was a delegate to his party convention at Peoria in 1897, he was influenced to offer for incorporation in the party's state platfrom a plank for good roads. "But," he added, "I was nearly mobbed for it by some of the down state democrats." He told of opposition to good roads while he has been mayor beginning in 1897—"when I first began to run for mayor of Chicago." At that time he and Commissioner of Public Works McGann decided against the further use of cedar block for pavement in the city. This aroused opposition, but he stood for good pavement, he said, and later some of his earlier opponents came to him and thanked him for the stand he had taken. Now the city has, he declared, a road building plant entirely sufficient for the present demands. It collects $800,000 wheel tax annually and uses it in the construction of improved streets.

"Toronto," said Mayor Hocken, "has recognized the value of good roads more than any other Canadian city. The city has come to realize that macadam is not good enough paving for heavily traveled streets, though for a long time we did not diagnose our troubles rightly. We now have a plan for road building that includes an international highway from Toronto to New York and later to Windsor and Chicago. We are building a 40-mile stretch of road now out of the city, and of this cost the city is paying 25 per cent, or $150,000. The need of good roads is as imperative for the farmers as for the city residents, though the former do not seem to realize it. The state, too, has a responsibility in this matter, and it is realized in Ontario. Our provincial government there now pays one-third of the cost of road building in the province. Several million dollars was asked for from the federal government, but the senate of our government refused to pass the appropriation and it fell through. However, it shows we are working in the right direction. In closing I want to mention the working people of Toronto, who are doing more than any other class of citizens in caring for the city streets."

Mayor Hocken closed with an appeal to meet the question of unemployment by good roads work, and to see to it that the good roads laborers secured employment during the months of the year when road work is impossible on account of weather conditions.

Mayor Powers told of the commission form of government which is in operation in St. Paul, and stated that he, with some other of the commissioners, was in Chicago to learn of proper good roads work from the meetings of the congress. He told of the construction of 25 miles of paving last year and plans for 30 miles this year. He stated that St. Paul was developing a policy of improving all roads running into the city, whether they are within the limits of Mercer County or not. He ended with a reference to the resources of Minnesota, "the Bread and Butter State," mentioning its wealth of iron.

At this point Mr. Edens presented to Mayor Harrison the spade with which the final work was done on the first piece of state aid road opened in Illinois. This event took place during the week of Dec. 12, 1914, at Blue Island, a suburb of Chicago. Mayor Harrison in accepting remarked that the spade would be used in digging up additional funds for good roads.

W. A. McLean, President of the Road Builders' Association, was next called upon and spoke briefly of his satisfaction in the work for good roads which was increasing throughout the country.

Nelson P. Lewis, Chief Engineer of the Board of Estimate and Apportionment of New York, N. Y., spoke next, devoting his remarks largely to the American Road Builders' Association, outlining what the organization stands for. Mr. Lewis' speech follows:

"The American Road Builders' Association stands primarily for the technique of road building. This includes the rational designing of a system of roads or streets for urban districts, for the connection of small centers of population with the great cities and with each other, for the articulation of these roads with those of the next larger unit—the county, for the articulation, in turn, of the roads of one county with those of adjoining counties, making thereby a real system of state roads, and finally for such intelligent cooperation between the states, with the aid and service of a federal bureau of roads, as will result in a system of national highways—not a system built and maintained at the expense of the national government, but a system so intelligently planned and so standardized with the aid of a federal bureau that passage from one state to another will not be evidenced by an obvious improvement or deterioration of the road surface, or by the neat or slovenly aspect of the roadside. Such a system should be determined by the actual needs and the best interests of all the people, and not by the selfish desires of those who happen to live or own property on the line of any particular road, or by the ambition of a state, county or municipal officer, or of a Warwick or uncrowned king, sometimes called a "boss," who is supposed to make or unmake such officers.

"The technique of road building, of course, includes a careful study of the availability of local material for road construction; when it is more economical to use a shorter lived material of low first cost, but which will require frequent renewal, and when conditions are such as to warrant the importation of the best and most durable material that may be secured, even though the cost be considerably greater. To spend $15,000 or $20,000 per mile on a road which will be used by fifty or one hundred vehicles a day is poor business. It is almost as bad business to limit the cost of a road which will accommodate 5,000 vehicles a day to $5,000 a mile, because there is some cheap local material which will build a road that will last a few months under such traffic.

"The American Road Builders' Association also stands for sane methods of financing highway improvements. It deplores the tendency to incur enormous debts for long terms of years for the purpose of building roads that will last but one-tenth of the period for which bonds are issued. It believes that any scheme for road improvement should include a definite program for the upkeep and surface renewal of the roads as well as their original construction, and that the responsible officials and the general public as well should have a pretty clear idea as to how much it is all going to cost, how the money is to be raised, and, if a debt is to be incurred, how and when it is going to be liquidated, and whether there will be anything left of the roads after they are paid for.

"The Association also stands for an organization that will be permitted to handle a business and highly technical problem, such as the planning, construction and upkeep of a great road system without constant political interference. It is unable to see the relation between this problem and those of tariff reform, the regulation of the trusts, the political status of the Philippines or the policy of this country towards the rival factions in Mexico or the several countries engaged in the great European war. We believe first in the adoption of a sane constructive program and then in a continuity of policy and purpose in carrying it out. We favor the creation of administrative units of sufficient size to permit effective organization without excessive overhead charges. Some of the greatest obstacles to efficiency in highway work are too small local units, lack of expert service and the firm conviction on the part of almost every citizen that he is as competent to build and care for a road as he is to sit in Congress or to fulfill the duties of a cabinet minister.

"We do not consider that it is necessary for us to engage in a propaganda to arouse interest in road improvement. There are other organizations which are doing that, and doing it effectively. The automobile maker and owner will see to it that interest in the question does not die. Our purpose is to see that this interest, once aroused, is guided along rational lines, and that the improvements which are made are planned in a rational fashion, and that the work is sanely financed, skilfully and honestly done, and efficiently and economically maintained."

R. J. Finnegan told of wasteful efforts to maintain Illinois roads and of the "throwing of thousands of dollars into the mudholes of Illinois during past years." He mentioned the organization of which he is secretary and stated its problem as being one of dirt roads. "If this congress," he said, "can present some method by which these roads can be improved and maintained, it will have performed a great mission."

Frank Terrace, of Washington and Oregon, praised the resources of those states and called attention to the great work for good roads which had been done there in two years. "Two years ago," he said, "there was not a piece of improved highway in either of them. In two years, however, more than $3,000,000 has been spent in road building." He referred to the scenic highway along the Columbia River, which he prophesied would be the greatest of the kind in the world. He pronounced good roads a matter of patriotism.

A. D. Gash, President of the State Highway Commission, appointed by Gov. Dunne, of Illinois, gave some interesting figures regarding work in that state. He said that when the plan of the commission is completed there will be 16,000 miles of first-class roads, which will cost about $180,000,000. At this rate, he estimated that the per capita cost of the roads to the residents of the state would be about $30. Farmers are paying, he said, at the rate of 8 cts. per acre per year for twenty years, or a total of $1.60 per acre. This he declared would be more than offset by the increased value of their land when the work was done.

James H. MacDonald spoke briefly, and praised the support given him in his efforts for good roads in Connecticut by the League of American Wheelmen. He said that now automobiles have come and farmers are realizing the value of good roads the movement for them will go on to a successful conclusion.

Wednesday, December 16.

SECOND SESSION, 10:30 A. M.

CHAIRMAN A. W. DEAN: The President could not be here this forenoon and asked me to preside in his place. I will not take up any of your time with preliminary remarks.

The first paper on the program is entitled "Road and Pavement Dimensions—Widths, Depths and Crown" by Mr. Linn White, Chief Engineer of the Board of South Park Commissioners of Chicago, whom you all have heard before, possibly, and who can handle this subject with the greatest of knowledge. (Applause.)

ROAD AND PAVEMENT DIMENSIONS—WIDTHS, DEPTHS AND CROWN

By LINN WHITE

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The dimensions of roads and pavements—width, depth and crown—are, to an extent at least, capable of analysis and scientific determination. Yet a consideration of practice in these respects indicates that pavement dimensions are generally fixed by precedent, experience or arbitrarily established rule.

It is hardly true that the construction of every road or the paving of every street is an original problem in itself requiring the collection of data and the independent determination of dimensions. Some standards must be adopted and rules formulated that are somewhat arbitrary and empirical, for the sake of uniformity, if for no other reason. But, in spite of this necessity, the design of a road—width, depth and crown, as well as longitudinal grades and character of wearing surface—should be adapted to the traffic, soil, climate, drainage, etc., of the particular locality in which it is situated.

It will, therefore, not be attempted in the brief discussion of the subject within the limits of this paper to formulate definite rules as to proper dimensions of roads and pavements, nor even to tabulate examples of practice that may be considered good or bad, but to point out certain more or less evident principles governing their design with the expectation that in the discussion that may follow examples of practice will be brought out.

In response to inquiries recently made for data pertaining to this subject and for the purposes of this paper, two of the replies received are illustrative of extremes of practice with regard to the establishment of hard and fast rules—especially as to *crown* of pavements. One from one of the largest cities in the United States where within the last few years very radical and decided advances have been made towards an efficient administration, states "an old ordinance (still in

GROUP OF DELEGATES TO THE FIFTH AMERICAN GOOD ROADS CONGRESS, CHICAGO, ILL., DEC. 14-18, 1914. PHOTOGRAPH MADE IN THE ARENA AT THE INTERNATIONAL AMPHITHEATRE.

force) introduced by the Survey Bureau makes the crown the same for all classes of city pavements." There may be a sound reason for stating in a local improvement ordinance the crown of the street but why should a general ordinance passed years ago fix the crown of all pavements at one figure through all the varying conditions of traffic and advances in the art of paving? Another reply received from a state highway commission which has long been considered an example and teacher for other highway commissions, says it has no "hard and fast" rules of practice as to depths and crowns of pavements.

Here are two examples of exactly opposite extremes of policy, and the facts are, the latter mentioned highway commission has certainly lost nothing in quality and reputation of work by leaving the questions of depth and crown of roadway pavements to its engineers where such questions belong.

Widths of roadways are governed primarily by the extent and character of traffic. A highway may be designed for the passage of only two vehicles with no provision for standing next the curb, in which case the paved width can scarcely be less than 16 ft. As the importance of the highway increases and vehicles at higher speed use it and more provision for standing room, foot passengers, etc., must be made, the width should increase to 18, 20 or 24 ft. A street is generally paved to a greater width because of the necessity of standing space in front of the more closely spaced residences and stores. Twenty feet between curbs may be considered a narrow street, especially in our newer towns and cities of the West. In the older communities and older towns the narrowest streets are to be found but they are not examples to be followed. As instances of narrow streets in our own country and time note the older portions of Boston, St. Augustine and Havana. In a recent publication descriptive of one of the remarkable royal cities of an earlier civilization it is stated the average breadth of the main streets was less than two meters.

The necessity of light and air between the bordering rows of buildings, proper proportion to heights of buildings, the desirability of trees, parkways, and other beautifying features, are reasons for additional width in streets which generally do not apply to roads or highways, though in these relations the width to be considered is between extreme lines rather than the paved width.

In a comparison between the paved width of streets and roads note should be taken of the fact that in streets the whole width including gutters is uniformly paved and used by the traffic, whereas in speaking of the paved width of a road as, say, 18 ft., the earth shoulders and gutters are not included—an additional width on each side of perhaps 5 ft., bringing the total width of such a road up to 28 ft. As an instance of the difference that may properly be made in the width of a street because of stopping and standing vehicles next the curb the following instance may be cited. One of the principal business thoroughfares leading out from the central portion of Chicago borders public park territory for more than a mile. A double track electric car line was on the street and on the side next the park the pavement was made 12 ft. wide from rail to curb, while on the opposite side where the property was devoted principally to business purposes the width was 18 ft.

Manifestly the strongest argument for keeping the width of pavements down to a minimum is that of cost, both of construction and maintenance, where the total width between property lines is not cramped. However, for certain reasons mentioned above, mainly esthetic, applying especially to residence streets, boulevards and highways, the pavement should not occupy the whole width.

The boundary lines of roads and streets are often encroached on by owners of abutting property and the actual width reduced by projecting steps, entrances, pilasters of buildings, etc. The laxity of supervision that permits such appropriation of public property to private uses cannot be too severely condemned. An encroachment once permitted is difficult to remove, and as time goes on is more and more objectionable. Encroachment on the public highway should be as vigorously guarded against as on private property. In the design of pavements sometimes features of construction are introduced that reduce the effective width, such as badly designed catchbasin inlets, excessive cross slopes near the gutters, raised crossings and approaches to intersecting sidewalks, etc. There is nothing logical in a design that calls for a catchbasin inlet at the corner of intersecting streets with deep gutters and high curbs, and then, as a means of overcoming these unpleasant features, a raised crossing approach that forces traffic out towards the center just where congestion is the greatest.

In the improvement of country and suburban highways more latitude may be taken as to dimensions and character of pavement than on city streets. Conditions are generally more varied. Location, grades, drainage, foundation, materials of construction, require more individual study and collection of data. It must be remembered the kind and quantity of traffic in any district—the population and industries—change and develop with the construction of roads. A good road is the most potent factor in the upbuilding of a community and it should be constructed to carry not only the existing traffic but the increase that will be stimulated by the construction of the road itself.

Correct relation between the service demanded of a road and the elements of design, which include carrying capacity and durability, is essential in the construction of any good road. The proper depth or thickness of pavement is a large factor in determining the capacity and durability. Under modern conditions we can not get away from constant maintenance if we are to have satisfactory roads and streets. Therefore it is impracticable to construct so liberally and permanently as to entirely resist wear. The Romans achieved this to a considerable degree in their roads which were several feet thick built of layers of stone blocks. So their principal roads, or some remnants of them, exist today but do not meet any of the needs of today. They did not know, apparently, much of the art of subsurface drainage or preparation of the roadbed to receive the stone, and while it is possible they may have crowned the surface to take away the surface water, there is little doubt but their roads were rough, dusty, non-resilient and generally unsatisfactory according to modern standards. Certainly they would be now, and were then, expensive to construct. At that period there were but few roads, only between important points and principally for military purposes. Now the demand is for roads everywhere built as economically and as efficiently as possible. The thickness, no matter of what material constructed, should be the minimum compatible with intelligent planning. With all the foresight that can be exercised a road good for this decade will not be good enough for the next decade, all of which is but saying a large part of the road problem is a maintenance problem.

An efficient thickness of pavement involves all other elements of economical construction—proper underdrainage, compaction of subgrade, crowning and waterproofing of surface, etc.

With all the kinds of wearing surfaces that have been devised—stone block, brick, creosoted wood, asphalt and tar compositions, oiled and water bound macadam, and the infinite variations thereof—there are only two recognized materials for foundations—concrete and macadam. The main difference in the action of the two is that concrete is a practically homogeneous material, the particles positively bonded and knit together so there is a beam or slab action carrying the wheel load over a comparatively broad expanse of base, while macadam is made up of separate particles which are inter-supporting only and transmit the load from one particle to the others beneath. As one particle of stone in the surface may be supported on two, three or four particles immediately below, and each of them on an equal number in the next lower layer, and so on down to the earth beneath, we may reasonably estimate the wheel load is spread to the earth base at an angle of approximately 45 degrees in all directions. Thus if the contact surface of a wheel is 4 by 6 ins., and the load on each wheel 2,000 lbs., it will be spread over approximately 2 sq. ft. of supporting earth. If the supporting power of the earth is 1,000 lbs. per sq. ft. (authorities give from 500 to 2,500 lbs. per sq. ft., according to character of earth, effectiveness of drainage, etc.) we may conclude our macadam foundation is thick enough to carry the load.

A concrete foundation will obviously spread the load to a greater extent than macadam on account of its homogeneity and consequent slab action, and may be made correspondingly thinner. Calculation of the thickness of a concrete foundation, however, would be fruitless as the breaking strength of a 5 or 6-in. slab of concrete made as such concrete usually is cannot be very high. Cracks occur in concrete foundations on account of contraction, settlement, etc., which destroy the slab action. There is another reason why concrete pavement foundations can safely be made thinner than macadam, and that is the greater stability of the mass or resistance to lateral displacement.

If there is a wearing surface of blocks, asphalt composition, or other material, on top of the concrete or macadam foundation it will further assist in the spread of the load. The transmission of the load to the foundation through a wearing surface of blocks can only be safely calculated in vertical lines with a surface contact the size of the block, on account of the vertical joints between blocks.

The thickness of the various types of wearing surface is mainly governed by practical reasons. It is not by any means true that pavement surfaces generally are to be improved by arbitrarily increasing their thickness. Two inches is probably the practical and economical thickness for asphalt and asphaltic concrete wearing surfaces because before the two inches is worn away the inequality of surface becomes a serious objection and a greater thickness would allow it to roll and shift when softened by hot weather. Creosoted wood blocks cannot be made less than 3½ or 4 ins. thick because the blocks would split too easily.

The crown of a pavement is a matter almost entirely of surface drainage. Even though a road or street has a considerable longitudinal grade it is necessary to carry the surface water to the gutters. The crown probably assists somewhat in keeping the central portion of the street clean as dust and dirt is more easily swept to the gutters by rain, winds and passing traffic. As far as the use of a pavement is concerned it would be more desirable to have it level in cross section, and under certain conditions safer. A vehicle turning on the outward sloping crown of a road is pitched in the wrong direction and if the pavement is slippery tends to slip or skid. The outer rail of a railroad is raised on curves to assist in turning the curve and the better to resist centrifugal force. On a street pavement the inner rail, so to speak, is raised, and, according to any method of construction yet developed, necessarily so. The problem is to reduce the crown as much as practicable and establish reasonable rules for distributing the pitch fairly evenly across the width of roadway. The character of wearing surface has much to do with the amount of crown permissible.

The following list of pavement surfaces is arranged in the order of amount of allowable crown:

Water bound macadam.
Oiled and tarred macadam (surface treated).
Stone blocks.
Brick.
Bituminous concrete (mixed before laying).
Sheet asphalt.
Creosoted wood blocks.
Portland cement concrete.

In this list creosoted wood block is put near the bottom because it is a slippery pavement surface and needs a flat crown. Also by reason of the true surfaces and gauged size of blocks it can be laid close to a theoretical grade. Portland cement concrete is put at the bottom of the list, not because it is slippery, but because on account of construction methods it can be screeded or struck to a fairly exact grade, whereas other plastic pavements, bituminous concrete and sheet asphalt, cannot be made so exact on account of the necessity of rolling after spreading to secure compression.

If the longitudinal grade of the pavement is practically level the crown must be greater at catchbasin inlets than at gutter summits between inlets unless the grade of center of roadway is carried up and down with gutter grades, which is not a desirable method. On streets with longitudinal grades requiring water in gutters to flow all in one direction and on country highways where drainage is carried away by surface ditches, the crown may be made the same at all points.

The cross section of a pavement may be a segment of a circle, parabola, or two inclined planes connected with a segment of curve. Either of the two latter forms is preferable to the first because a segment of a circle makes the pavement fairly flat in the center and grows unpleasantly steeper near the gutters. The inclined planes or parabola "get away" on a quicker slope from the center and do not so materially increase as the gutters are approached. Traffic then will use all parts of the pavement with fairly equal facility and ease. In the case of roadways with surface car tracks in the center the cross section adopted should provide sure and positive drainage away from the rails, and a simple inclined plane from the rail to the gutter is probably the best.

Whatever theoretical crown or cross section is adopted it should be remembered that in actual construction the cross section will be only approximated. It is not practical to set enough grade points or to maintain them carefully enough to attain the theoretical section.

In practice, in setting grades for crown or cross section, it is common to adopt a rule of measuring say one half the distance from the center and dropping one-fourth the total crown. This will give a segment of an all curve cross section. Another rule may be to measure two-fifths the distance from the center, drop one-fourth of crown and thence straight to the gutter. Other modifications of such simple rules may be devised using three points on wide roadways between center and gutter, approximating more closely to a true parabola or providing longer inclined planes and a shorter connecting curve. It is sometimes advised to increase the crown on pavements having considerable longitudinal grades, thus carrying the water more quickly to the gutters. The opposite practice is generally better—to decrease the crown on steeper grades. There are two reasons for this—the tendency to slip or skid is less and the washing or cutting action of water is less than on the increased crown section.

CHAIRMAN DEAN: Gentlemen, we will now listen to a discussion on Mr. White's paper by Mr. A. R. Hirst, State Highway Engineer of Wisconsin.

A. R. HIRST (State Highway Engineer of Wisconsin): Mr. Chairman, and Gentlemen: I did not have the pleasure of seeing Mr. White's paper before appearing here, and due to various complications I did not have the pleasure of hearing some of it, so that I think the only contribution I can make of value is possibly to state the practice in Wisconsin as to width, depths and crown.

We build a very large mileage of very low-class country road. Our construction is narrow. We have adopted for single track road a 9-ft. width and endeavored to obtain on this 9-ft. width a crown of at least 4 ins., very slightly less than 1 in. to the foot. I know that we differ from practically every state in building such a high crown and while these crowns may seem excessive when the roads are newly constructed there is no remarkable excess after one or two years. I seriously doubt whether with a 9-ft. road it is possible to make the crown too high with the ordinary machinery available, and it is inevitable that the crown is never going to get larger and is certainly going to get less with wear. We build most of our roads—and I think it is common in most states—immediately after the rough grading is completed. I believe some settlement of the fills is inevitable, and this settlement becomes evident in the crown of macadam roads after a year or two.

With the closer following up of construction with surface maintenance in the case of water bound macadams and gravels, I believe it will be possible for us to slightly decrease the crown. There can be no doubt that the less crown we can build and shed the water to the ditches the better for the road surface, as the less crown the more encouragement there is for the traffic to get away from the center of the road. We have established, in our own minds—we haven't been able to convince any one else however, of the correctness of the principle—that the only thing that will drive the traffic on an ordinary crowned road from the center of that road is more traffic. In other words, irrespective of the width of the sufacing or its crown, wheel traffic of all descriptions will follow the center of the road and make a rut there no matter what the width.

If you have a pavement on which the travel is so large that this traffic will be distributed you must of course build a two-track highway. In Maryland in the old days we considered a 12-ft. road a double-track highway. In Wisconsin we adopted a 14-ft. standard. We changed this year to a 15-ft. standard for a double-track highway, and I am not at all sure that next year we will not move up to an 18-ft. standard, especially on those roads which we believe we are constructing for a long period of years, such as concrete and vitrified brick.

I believe that a mistake is being made by any state which constructs roads which are going to be available for through traffic if they build them less than 18 ft. wide. Our experience has been that if you do not provide an ample double track you had better provide only a single track because the 12, 13 or 14 ft. widths are simply invitations to disaster. The automobile drivers think they can pass at 40 or 50 miles an hour and sometimes they think wrong. The 9-ft. roads which we have built have caused very few accidents because drivers know that they must slow down when they pass another machine, while in the 12 and 13-ft. roads they think they can pass and they stay on the surfaced portion. We have built nothing wider than 18-ft. except one road in the neighborhood of Milwaukee which we built 40 ft. wide for reasons other than accommodating the traffic.

As to the depth, most of our roads, both of gravel and macadam, have a finished depth of about 7 ins. The depth is the same at the center as at the edge. We put no crown on our macadam and gravel roads with material. In other words, the subgrade is the same shape as the finished surface.

A practice which possibly we may adopt—I am trying to get my nerve up to the point of adopting it—is to build the second course of our macadam and gravel roads wider than the first course. Those familiar with traffic conditions know that on the average country road about 9 or 10 ft. carries at least 90 per cent. of the vehicle traffic; that outside of those limits there is simply an occasional passing and getting off of possibly one wheel—in most cases the light wheel. It seems entirely possible that the construction of a first course of 9 or 10 ft. of ample macadam thickness with an extension each side of a second course 2 or 3 ft. beyond that point is entirely logical. We find something of that effect in the construction of some of our macadam roads. The cases in which the shoulders of roads will hold up when even small amounts of screenings go off on the shoulder, maybe a fraction of an inch or so, are surprisingly many. I think we are coming in Wisconsin to the point where, when the 9-ft. width is not ample, and where there is quite frequent passing of vehicles, but most of the passing vehicles are light, we will wing out the courses, building a 9-ft first course and making the top course 15 or 16 or even 18 feet wide, and get a road giving an effective width of 15 or 16 ft. with less materials than you would a full depth 12 or 13-ft. macadam, and I believe it would be just as efficient.

We never build a macadam or gravel road with a thickness of more than 8 ins. If 8 ins. of finished macadam or gravel will not stand up under the traffic it is a sign that the road is not properly drained and the additional material won't help matters.

As to concrete, we built this year in the neighborhood of 50 miles of concrete. We adopted a uniform standard on all soils of 8 ins. in the center and 6 ins. at the side for roads of 15 to 18 ft., the crowns varying slightly. On the narrower roads the crown was ¼ in. per foot, the side depth being 6 ins. and the center depth varying with the width. We have experimented somewhat in Wisconsin with 9-ft. concrete roads with gravel or stone shoulders. I believe we have something like seven miles of that type, and while these gravel and macadam shoulders amply serve the purpose and keep traffic out of the mud, I am not convinced that an earth shoulder, where the nature of the soil is good, does not offer better facilities for turning out for the greater portion of the year. It is impossible to roll these gravel or stone shoulders without danger to the concrete. A loose surface is the result (at least for some time) and if an automobile turns out into this loose surface at a speed of 30 or 40 miles an hour, it is dangerous. The earth surfaces are less dangerous.

On our wider macadam roads, 15 to 18 ft., we are setting them for a crown of ¾ in. per ft. with the idea that after they are finished we will get a crown a little greater than ½ in. per foot. If you want to get macadam crowned to the height shown on the plans where the subgrade is parallel with it, you have to crown your subgrade considerably more than the expected finished crown of your macadam. I thank you, gentlemen. (Applause.)

CHAIRMAN DEAN: The next gentleman to discuss this paper is Mr. H. R. Carter, State Highway Commissioner of Arkansas. Is Mr. Carter present? Mr. Carter is not present and I understand there is no written discussion.

The next gentleman is Mr. S. D. Foster, Chief Engineer of the Pennsylvania State Highway Department. Is Mr. Foster present? Mr. Foster is not present.

The next gentleman is one of the originators of the American Road Builders' Association and its first president, Mr. James H. MacDonald. (Applause.)

JAMES H. MACDONALD (former State Highway Commissioner of Connecticut): Mr. President and Fellow Delegates: I find myself about in the same position that Brother Hirst did in reference to having access to Mr. White's paper, and I feel a good deal as did the minister who apologized to his congregation on Sunday morning, saying that he had been very busy through the week and hadn't had a chance to prepare his sermon so they would have to take what the Lord sent them, but that the next Sabbath he expected to do better. (Laughter.)

I think that the only thing we can do with this great question, with its three very important heads, is to touch and leave it as quickly as possible, stating the practice that we have each followed in our respective localities. It is to be presumed that the questions of line and grade and drainage have already been taken care of when we come to the width, the depth and the crown of the road. I think that in the discussion of highway improvement we have been, and are now, too much inclined to skip by the essentials in road building and leave the primary department a little too quickly and get into the elementary department.

I know that in this question you will all agree with me that each particular locality is a governing principle to itself. The question of material, the question of accessibility or privilege to do is a matter for each locality, and very largely a question of finance. In my own state we were very glad to commence with small beginnings, for we had very little money. The result was that our beginning was in a very primitive way and I think for many years to come—and I don't say it in a discouraging way at all—you will find that with only 10 per cent. of the roads improved, and those which have been improved principally east of the Mississippi River, we will go down to the first principles of road building.

The subject of Mr. White's paper was too large to treat at length, for each one of the subdivisions of the subject is a very important feature in road building. And I often wonder if we do not make a mistake in these discussions in not devoting more time and attention to the great question of the different kinds of pavements that are to be installed throughout the country; taking the shoulders, taking the width of the roads, taking the depths of the roads, taking the drainage of the road and all those constituent parts that go to make up that which constitutes a road, and devoting an entire session to the question of, for instance, a gravel road. Every one of these questions very largely depends on the others. The width of the road has to do with the depth, and the depth of the road has to do with the width, and so it would seem to me that in the discussions it would be wise sometimes to take up the gravel road and take every constituent or component part of that type of road and discuss it—everything connected with a macadam road, and discuss that.

I remember that I was hounded from Dan to Beersheba, from one end of my state to the other—and outside of my state—because I was so strongly intrenched in my views in regard to water bound macadam; but I believe that a macadam road has its place in the world and for many years to come it will be built. I remember that in the great state of New York where they have millions of dollars to expend in the letting which is to take place in January, over one-half of the contracts that are to be let will be for water bound macadam. Now, that is very largely determined by reason of the fact that it is difficult to get stone in one place, and it is difficult to get gravel in another place, and the question of finance enters largely into it. So I think that the outcome of this paper will be the suggestion that we have the question of the gravel road, the macadam road, the granite block and wood block pavement, the brick road and all those things discussed right straight through from the foundation of the road right up to the finished state.

The width of the road with us was a very difficult matter in my state by reason of the fact that we found a great many of the farmers desired to, and did appreciate their little holdings by just creeping over the fence, shoving it out every time the fence fell down. The grass was very sweet just over the fence, and while originally the road might have been laid out three rods, four rods or six rods wide, it had gradually crept into a smaller space until in many instances the road was barely two rods wide. That may, perhaps, provoke a little smile on your part, and yet the same thing is the curse of the cities of our country. There has been no protection for the city street; certainly not as much for the city street as there should have been. There seems to have been no forethought at all in the early days in the building of our cities as to the question of a building line. If that question of a building line had been as carefully thought out in the early days of construction or laying out of our cities as this question of highway improvements is being discussed by us today, you would not find the condition of congestion that you find both in the street and on the sidewalk that we have in some of the largest and most important cities of our land today. So, I say, that of this great convention and kindred conventions that are gathered together in this way from all parts of this great country, there is no man living who can measure the influence of good that is going to come through the interchange of opinions and views in regard to this great question.

Speaking about the other side, I would not, if I could, decry in any way not only the roads on the other side of the water, but the roads in any city or any state in the country, but you now have a very good demonstration that the roads were not laid out with the view to their future use. It is only two or three years ago when they wanted to connect Holborn with the Strand. It would cost $30,000,000 to make the connection, but they so provided in the purchase as to get a return from the additional width amounting to $21,000,000, which they used for public purposes after the street had been built. It would seem to me then that the subject-matter of Mr. White's paper will be food for reflection and profit for us for many a day to come.

In the width of our roads we try to establish a width between fences of not less than 12 ft. for the traveled path, 3 ft. for the shoulder or support of the road, and 2½ ft. for the gutter, widening out the gutter as the volume of water and the distance it has to be carried increase. That was only in instances where we were controlled by conditions. We increased that to 16 ft. Of course, when we started in 1895 we had no thought of the automobile which has revolutionized everything connected with road building in our eastern states. That which was good yesterday and took care of conditions that were to be met with will not fit the conditions that we have today. The traffic, as was so well said, will determine very largely what the width of the road should be. Our maximum width is 16 ft. with a 3 or 4 ft. shoulder or a 5 ft. combination shoulder and gutter.

We found a condition to contend with that some of you out in the West don't have to meet. We had no checkerboard plan. It seemed to us in my own little state that there was one special letter in the alphabet that they were specially fond of in the laying out of roads, and that was the letter "S." I have spent more money during the last few years in extending the sight line, in many instances, than I would for two or three miles of road adjoining this particular weak spot. All turns have to be widened where we have the heavy traffic. The curves are banked now, and there isn't very much thought of the roads that are secondary roads.

The depth of the road is very largely a question of subgrade. In the cities it will be necessary to put down good, substantial foundations, for cities are simply little pieces of ground cut off from many farms. Each city block was at one time either given up to timber or a part of a farm, and there was no line and there was no grade. As this great city of Chicago grew into the position for line and grade, it was a dumping ground for all kinds of material—sand, gravel, ashes and refuse of all kinds. While we put the foundation under the country road to suit each particular condition we can't do that very well in your city streets. The day has come when the city street is one of the most important factors that you have to consider in taking care of the interests of the city, for today that which is under the street is quite as important in its function as the traffic that is carried over it, or the business that is abutting the street. All these things that we have discussed today as foundations for city streets will have their day. They will have their generation and, like everything else, in obedience to the march of civilization and intelligence it will be necessary to change things as the necessities of the hour may dictate in order to meet each particular condition as it has to be met with.

In the early days of my state it was necessary to clear the land, to grow the crop, to take care of the little home, and to take the stones cleared from the land and put them in a fence. Now, as these stones have performed their function until now and as we have the money with which to do, we take the stones out of the fences and place them in the road and make a good, strong telford base to carry the produce that has been grown on the farm to its nearest and best market place. That can be done and, in my judgment, there is no foundation today for a country road that is equal to or as good as a well built telford base. It is resilient; it will bear repair; it is easily constructed. It is a simple process to take from the fences the stones ranging in size from 10 to 15 or 18 ins. long, from 6 to 8 ins. wide, and from 8 to 10 ins. deep, lay them vertically in courses across the road with the broadest edge down, and with not too many small stone, bond these stones and then wedge them up and break them back. Then you have a foundation that will stay there for a thousand years; that in obedience to the demand of the traffic in the future will sustain it and take care of it.

I always believe that the essentials in road building are the question of water reduction, the question of drainage, the question of width of road and taking care of the sight line. When you have those and the question of foundation you will have the essentials of road building, and they will be the essentials for many years to come. The question of surface will always follow naturally in obedience to the traffic that it is called upon to sustain. The question of the depth of stone and the question of the foundation are matters that force themselves into the matter of traffic conditions. If we build a good gravel road, we have to start with the foundation. We see to it that there is nothing there which is likely to heave, yield or settle, and that all vegetable matter is taken out. The foundation was put in right to start on, and then we arranged for a gravel road covering three courses, two 3-in. courses and one 2-in. course. That was for our best gravel roads. We built some other gravel roads that were not quite so heavy. The well-built gravel roads are laid in courses and built with stone ranging in size from 1 in. to 3 ins. for the first course with 80 per cent. gravel and 20 per cent. bonding material. The second course is of stone ranging in size from 1 in. to 2 ins. in the longest diameter of the stone, the smaller size predominating, starting with 80 per cent. gravel and 20 per cent. bonding material, and the top course is 2 ins. deep with no stone exceeding 1 in. in the longest diameter with 60 per cent. of gravel and 40 per cent. of bonding material. If the courses are rolled wet and put in condition they will make as fine a road to travel upon, for the condition that it has to meet, as any road that I know of.

As regards the cross grade, I think that that is one of the things that is important. In a gravel road, as Mr. Hirst very well said, it settles very easily. I have always specified for gravel roads, however, that when they are finished, they shall not show a mark of hoof or wheel. The engineer in road building is supposed to arrange a standard that won't leave any doors or windows in his specifications.

We build our macadam roads 7 ins. deep. We use that depth so that the smaller stones predominating will make a solid and compact road before the roller is put upon it. We bonded the road from the top. We didn't care to have very much of the screenings with which to bond the road; simply enough to assemble it and to tie it. We depended for our bond upon the small stone that we had in the aggregate rather than in the screenings. That was a 7-in. treatment, two courses of 3 ins. and a top course of 1 in.

For the crown of the road I established from the start the ¾-in. grade—¾ in. to the foot on the gravel road or the earth road. I established a ⅝-in. grade on the macadam road so as to distribute the travel. I believe in many respects that this question of the proper grade of the road has more to do with our problems than anything I know of.

The hog-back road is a curse to this country. When you have one of these roads that run from 1 in. to 2 or 3 ins. to the foot, and a team goes over that road after you have constructed it and spent your money, I don't care what the road has been constructed of, or with, you are getting, no matter what the width that you have paid for, exactly as a compensation for the money invested just the width occupied by the two tires, or the four. If they are 4-in. tires, you are getting 8 ins., and that is what you are getting for paying for a 16-ft. road. In the hog-back road, with an excessive cross grade, you have either got to stay in the center of the road or go into the ditch. It adds to the length of the life of the road when you flatten the grade, because such a crown is an invitation to use every inch of that road. The result is that you have used your money wisely.

When you get down to the question of grades and width of roads and depth of material you are discussing very important matters, and you are discussing matters that many times are not up to the engineer in charge of the work. Many times when we are inclined to criticize we should remember when we talk about the work the engineer has done that "Each man is a world to other world's half known, and turns on a tiny axis of his own, and his full life's orbit is a particular wisdom in those brother planets that revolve with him." And so I have noticed that many times you will find in a city, in a residential place, a pavement that should have been on a business street, and a business pavement laid on a residential street; simply in obedience to some one who had the influence to bring that about. But this whole question is one that is broad enough to take care of it, and I am glad to see that this association has within its functions the privilege of starting a fire, kindling something that cannot be quenched, and has an influence for good throughout the length and breadth of this country; that engineers will be protected, that men who have charge of public work will be helped and assisted materially by just such an organization as this is, doing all that within them lies as is given them light to see their duty, to do it, and that as the work of this great association goes on its influence for good will be felt further and further until the whole of this great country will become what it was meant to be, not only first in arts, first in science, first in everything that goes to make a great country such as we all delight in, but will be first in this great influence of highway improvement. I thank you. (Applause.)

CHAIRMAN DEAN: The next gentleman, Harold Parker, advised me about ten days ago that he would not be here. It would appear that there will be hardly time to have any open discussion on this paper, and to complete the rest of the forenoon program. Should the discussion of the next paper terminate early enough, if there is any one who desires to discuss either paper there will be an opportunity. The next paper is "Road Foundations—Concrete, Telford, Gravel, etc.," by Mr. J. A. Johnston, Division Engineer, Massachusetts Highway Commission. Mr. Johnston. (Applause.)

ROAD FOUNDATIONS—CONCRETE, TELFORD, GRAVEL, ETC

BY J. A. JOHNSTON

Division Engineer, Massachusetts Highway Commission.

While vast sums have been, and are being, spent on roads, the work to be done is so enormous that the problem can only be solved by true economy, and it is not a question of what material possesses theoretical advantages over another, but what will give us the most for our money; not merely the most roads for if your roads are not properly built added mileage means added burden of maintenance; while on the other hand, if your first cost is more than conditions warrant, the interest on the investment may exceed the maintenance on a poor road. Of course the first problem in road building in its broad meaning, is the location and gradient, but in the more narrow acceptance of the term road building (meaning the traveled surface) the main factor is the foundation.

What to Use for Foundation—where—how—when—and quantity to use, is the science of road building. Many men have attained enviable reputations as road builders based mainly on the fact that their work was all done in a locality which was blessed by nature with favorable soil conditions.

In our earlier work, in Massachusetts, it was our practice to use foundations only in such locations as were unquestionably bad, and to take a chance on such places as were in doubt. We believed it was cheaper to later strengthen the weak places than to use extra material that might not be necessary. Under conditions then existing with comparatively light horse-drawn traffic and with mainly gravel and water bound macadam surfaces, this "take a chance" policy seemed a reasonable one, but, no one could predict the future developments and I doubt if we have actually saved any money by such attempts at economy.

Many road materials have been unjustly condemned when the real difficulty lay in the foundation and not in the surface material. There are many companies advertising their road materials as the final solution of the road problem, when as a matter of fact, their specialties are merely surfacing propositions, many of which would give excellent results if used over a proper base, but are far from being the whole road as one might infer from their claims.

Surfacing is secondary to foundations. We have taken old worn out macadam roads, rejuvenated them with a bituminized surface at a total cost of 10 cts. per square yard; maintained them in excellent condition for four years at an annual cost of 0.1 ct. per mile per vehicle, or about 1.4 cts. per square yard. On the other hand, we have all seen roads where the surfaces alone cost from $1.50 to larger sums per square yard for 2 ins. of bituminized material, which have failed, and gone to utter ruin in a very few years; not because the traffic conditions were so severe, nor because the surfacing material was poor, but solely because they were built without a proper base under them.

The statement has many times been made that a waterproof surface requires little or no foundation because no water can get through it to the soil beneath so the base is kept dry. Many horrible examples might be cited to show the fallacy of this belief. A little consideration of the capillary action of the soil which draws water from the sides of the road and underground sources, as well as the water that will seep through the soil from higher points, will show that a waterproof surface is not sufficient unto itself without a proper base. It must be understood that each road is a problem in itself and no standard treatment can be devised that will fit all conditions. There are many factors entering into the problem; soil, drainage, traffic, available material, all should be considered.

In some localities good gravel can be had at a low cost, but there are many places where good gravel would have to be hauled many miles, and the cost would be prohibitive. In other places stone is abundant and cheap, while in others there seems to be no material fit for foundation purposes and all must be shipped in.

It is true that if you can obtain the right kind of gravel, it makes an excellent foundation, but to give the best results it should be absolutely free from clay, loam or silt, and rather sandy. For instance, on such a base we have built macadam roads with only three inches of broken stone. There were a few soft spots in the spring where pockets of loamy gravel were found, but these were taken out when they developed, and one such road, which carried a considerable traffic, on the edge of a flourishing Massachusetts village, was kept in excellent condition at a low cost for maintenance for twelve years before it was resurfaced. In another place we built a section of road over a very soft bottom (practically quicksand) by first placing a bed of gravel 18 ins. deep, and over that 6 ins. of macadam. This road has been built sixteen years and has given no trouble. On the other hand, we have many miles of road built on gravel bases 6, 12 and in some cases 18 ins. deep, that soften up and rut badly in the spring when the frost is coming out. It is our practice to carefully locate all soft spots in the spring so that when funds are available for rebuilding such roads we may remedy the defect without guesswork.

Most gravel contains enough silt, loam or clay to so draw moisture by capillary attraction that the frost will work in it and, of course, when the frost crystals thaw, it leaves the material porous, spongy and wet. This condition is aggravated by the rolling wheels passing over the surface and the tamping action of horses' hoofs, which all tend to puddle it just as a tamper puddles concrete, drawing the moisture from below. Such a result, unless extreme, may not be serious if your road surface is of gravel or even water bound macadam, for such surfaces are easily and cheaply repaired, but if the road surface is a high cost bituminous mixture it may be ruined, and we cannot afford to take such chances. It should, however, be borne in mind that a road may stand two or three years over a poor bottom with little apparent trouble, but almost entirely go to pieces the third or fourth year. This fact has caused a great deal of trouble; for the inexperienced man finding that a road stands all right the first year assumes it will continue to do so, proceeds with the same type of construction under similar conditions until the first fails and the whole road is soon ruined.

Gravel alone cannot safely be trusted for foundation, and should never be used under a high cost surfacing except as a sub-base under stone foundation or concrete.

In our earlier work we depended largely on side drains built 3½ ft. deep at the edges of the macadam. A 5-in. pipe was placed in the lower part of the trench and the drain filled with small stone fragments. Our theory was that these drains would dry out the subgrade and keep the road surface firm. We built miles of these drains, but they did not accomplish the desired results unless they were supplemented by a stone base under the macadam, and subsequent experience has shown that, except in rare cases, if the road is built over a proper stone foundation, the side drain is unnecessary.

One of John McAdam's theories was that no stone larger than you could hold in your mouth should be used in a road. Now I have a large mouth, but it won't hold as large a stone as experience has proven to give satisfactory results for foundations in Massachusetts.

In the last 20 years we have tried many methods of subsoil drainage and many different forms of foundation. On some of our macadam roads with crushed stone 6 ins. thick the road has after one or two years softened up badly in the spring. We tried the experiment of adding more crushed stone, without breaking up the old surface. In some cases we added 12 ins. of new stone, making a total of 18 ins. of stone fragments not exceeding 2½ ins. in their largest diameter, and also built ground water drains each side of the macadam, and cross drains at 50 ft. intervals. The result was a failure, for after two or three years the road broke up as badly as ever. As these results were obtained in several places, I think we have proven crushed stone of small size is not satisfactory for foundation and is suitable only for surfacing. My theory of this is that the units are so small they have little bearing, and as they have no cohesion when wet sink readily into the mud. Regardless of theory, the fact remains that is the effect; and some of these stone particles have been found a foot or more below the original subgrade.

It should also be borne in mind that the cost of the crushed stone is nearly three times as great as that of the larger size fragments. As some one may take issue with this statement, I will illustrate: Under sharp competition our average contract prices for field and wall stone, rolled and measured in place in the road, is about $1 per cu. yd. Our average price for crushed local stone, finished in place in the road, is about $1.50 per ton. A 15-ft. road 4 ins. deep requires about 36.4 tons per 100 ft., exclusive of the dust used for binder; this is equal to 2 tons per cu. yd., or the crushed stone at $1.50 per ton equals $3 per cu. yd. It is, however, true that if the road were all crushed stone the unit price would be 25 to 50 cts. less per cu. yd.

When we first began building our roads, if we found a place which seemed to need a stone foundation we used a telford paving 8 ins. deep over 6 ins. of gravel. The telford stone were set up on edge, the tops broken off to a true cross section, and the joints wedged up and chinked. French drains 3.5 ft. deep were built at each edge of the road. These drains cost 35 to 50 cts. per running foot. A year or two later the specification was changed and the telford was only 6 ins. thick over 2 ins. of gravel, with the continued use of the side drain. The cost of this lighter telford was about the same as the thicker, and as the hours of labor were decreased and price per day increased we paid as high as 50c. per sq. yd. for some of this telford. Later we abandoned the standard telford and adopted the "V" drain, so called because it was roughly the shape of a broad "V" about 18 ins. deep in the center and 4 ins. at the sides, with stones not over 8 ins. in their largest diameter. The cost of this foundation for stone in place in the road runs from 75 cts. to $1 per cu. yd., or about 25 to 33 cts. per sq. yd. of road surface. This "V" drain is a combination of foundation and drain, the water flows in a channel in the center of the road, whence it is led off by bleeders to proper outlets. We built many miles of these drains or foundations only 10 ft. wide under macadam 15 ft. wide. This gave satisfaction in the earlier days, for the traffic did not spread over more than 10 ft. except when passing another vehicle.

While this practice was satisfactory under the old conditions, it has now been discontinued, because it is found that, as the high speed motor requires more room in passing, the whole width of the road is used. In fact, on our main roads we have been obliged to increase the width of the hardened surface from 15 ft. to 18 ft.

One objection to the "V" drain is the fact that, owing to the extra depth of stone in the center of the road, the frost action is not as great at that point as at the edges, where the stone is lighter, and a considerable distortion is occasioned in the road surface. When the frost enters the ground, the lighter sides are raised more than the center, with a resulting concave surface; later, when the frost is coming out, the sides thaw out more quickly and there is an exaggerated camber. These extremes do little or no damage to a surface of gravel, macadam, or a soft bituminous matrix, but the more rigid forms of surfacing would be disintegrated.

Because of these inherent defects in the "V" drain, we have for several years been building stone foundation with a flat subgrade. If the bottom is a soft clay or silty material, which would work up into the voids of the stone foundation, we first place over it a bed of sandy gravel, when such material can be obtained, varying in thickness as the conditions may require, in some places 6 ins., in others 12 ins., and over this stone fragments not exceeding 8 ins. in their largest diameter. The depth of this stone foundation is never less than 8 ins. in the center and 4 ins. on the edges, and under extreme conditions we have used 18 ins. in the center and 14 ins. on the edges. No attempt is made to place these stone as a paving, though some care is taken to lay the bottom stones on their broadest face to ensure a substantial bearing.

I am aware this is contrary to the theory that a stone laid flat will tilt and cause trouble, and that the usual practice is to place telford stone on edge, but without discussing the matter further at this time, I can assure you we have built many miles in this manner without trouble. Small stones are thrown on top to close the surface crevices, the whole is then rolled with a steam roller until hard and firm. This thorough rolling we believe to be one reason for freedom from trouble from tilting stone. If a bituminized surface is to be placed on the road the voids of the sub-base are filled with clean, sharp sand (and we insist that this material shall be clean), this is rolled without wetting and any surplus that remains on top of the base is swept off. This sand filling, however, is not an essential part of the base, but is used only to prevent the loss of bitumen. Bleeders are used, to drain the water from this foundation, at proper outlets, and care is taken to so build these outlets as to avoid future clogging.

Foundations of this description have a fairly uniform frost action, appear to be preferable to the "V" drain and have been satisfactory. The costs, of course, vary with the conditions, running from about 15 to 60 cts. per sq. yd.

If a surface of wood, stone or brick blocks, or the more expensive types of asphalt is to be used, a concrete base is accepted as the best practice. It is open to some objections, such as the delay incidental to proper setting of the cement, and the fact that because of its rigidity it will crack under irregular frost action in mixed soils. We have all seen the result of this latter trouble in badly cracked pavements over concrete bases. On the other hand, the cracks can be largely guarded against by proper drainage and it seldom cracks enough to cause disintegration, while if the cracks are due merely to frost action, they practically disappear (unless they are extreme) when the frost is out of the ground. On this, as on other forms of foundation, the engineer's good sense and experience may save much unnecessary expense. I have seen a concrete base, 1:2:4 mixture built 12 ins. deep over a natural bed of excellent gravel, where to use over 4 ins. was criminal extravagance. I have also seen 4 ins. of concrete used over a bottom where fairly hard soil and soft muck holes alternated, and the engineer in charge of this work could not understand why his pavement cracked so badly the following spring.

There is some difference of opinion as to whether it is better to build a fairly light base of strong concrete (4 ins.) of 1:2:4 mixture or a heavier base (8 ins. or more) of a leaner mix, 1:3:6, 1:4:8, or even a smaller proportion of cement. Conditions should decide this. In a mixed soil better results might be obtained by the greater depth of the lean mixture, as there would be less frost action at the greater depth, and the increased depth of the concrete slab should more than offset the loss in tensile strength of the material.

Of course, if it is planned to build a concrete road surface with the ultimate idea of surfacing it at some later time with bitumen, or other material, there is no room for argument as to the use of a rich mixture, for it is then necessary to so mix your concrete that it will withstand the abrasion of the traffic. If the bituminous surface is to be only a light one it is still advisable to use the rich mixture, as the shock of the passing traffic may cause enough surface disintegration to destroy the bond of the bitumen to the concrete.

Before closing I am tempted to refer to what appears to me an absurd action on the part of certain parties interested in bituminous surfacing processes who have been flooding the country with pamphlets attacking concrete roads. I hold no brief for concrete roads, but recognize their good points and recommend their use where I believe them best adapted to the conditions. There is certainly very little room for argument that under most conditions concrete makes an excellent foundation for a bituminous surface, so if, as these parties claim, concrete road surfaces are failures, they surely can be used as bases for bituminous surfaces, and the more concrete roads that are built, the more foundation will be ready for bituminous surfaces.

In conclusion, gravel, stone, concrete all have their places. There is no sovereign remedy for all conditions, and I wish to emphasize: To get the most for our money, each road must be considered a problem in itself.

PRESIDENT McLEAN (Succeeding Vice President Dean in the Chair): The discussion of the paper which has just been placed before you will be introduced by Mr. George W. Cooley, State Engineer of Minnesota.

A. D. GASH: Mr. Cooley went home last night.

PRESIDENT McLEAN: Mr. Cooley is gone. The next speaker will then be Mr. W. S. Keller, State Highway Engineer of Alabama. Is Mr. Keller here? Mr. Keller not here?

James R. Marker, State Highway Commissioner of Ohio. We are getting through the program at a good pace.

Mr. R. C. Terrell, State Commissioner of Public Roads of Kentucky.

R. C. TERRELL (State Commissioner of Public Roads of Kentucky): Mr. Chairman and Gentlemen of the Convention: You have heard this very interesting paper by Mr. Johnston and its discussion, from a northern standpoint. Conditions prevail in the East that do not prevail in the South. From a Kentucky point of view it is not necessary to put in a heavy Telford foundation.

I think that Mr. Johnston's main trouble in the sub-soil proposition was, as he stated, that for the first two or three years the road held together very well, and that after that time it began to break up. This is due to the fact that the small tiles used—the 4 or 5-in. tile used under the stone foundation, under the stone drains at the side—become clogged and allow a seepage of water under the road that causes that action in that particular territory. Where the sub-soil is properly drained, especially as it can be in the South where the frost action does not occur materially, you don't find that upheaval of the macadam or gravel road surface in the spring season, at least, to only a very small extent. The passing of a roller over the road in the spring will eliminate practically all rutting of the road. The gutters as well may become entirely frozen, if the water is frozen at the mouth, and become a solid line of ice, which permits a surface seepage of the water under the road.

From the southern viewpoint, that does not appear. We have about 10,600 miles of macadam and gravel road in the State of Kentucky, and of that total mileage I dare say there is less than one thousand miles of Telford foundation road. That road was constructed in the early days when the engineers were strong believers in the Telford foundation, coming from the North and East where the frost action prevailed. In the later methods of construction it has been entirely omitted. The earth has been graded up to its proper cross section, side ditches have been provided and the stone has been rolled down on the foundation. At first small stone was used but practice has shown that 2½ to 4-in. stone in the 4-in. sub-bottom course, properly rolled down will give a satisfactory foundation, with a 3-in. course of smaller stone and then the necessary screenings for a binder.

This type of construction is also used for the gravel road and from the Kentucky point of view it isn't necessary to have the gravel free from loam or clay. About 15 or 20 per cent. of clay is a decided advantage in gravel and usually is mixed in the gravel bottoms at about that proportion, so all that is necessary is to put on 8 or 10 ins. of good gravel and roll it down on a proper foundation with a subgrade of earth, and we have an excellent road that will last for a considerable length of time. There are few other points that I care to discuss in this paper at all. I am sure that Mr. Johnston has covered the main part of the subject excellently. I just merely wanted to call attention to the conditions that prevail in the Southern States. Thank you. (Applause.)

CHAIRMAN DEAN: The next gentleman is Mr. John H. Gordon, a contractor of Albany, N. Y. Is Mr. Gordon present?

Gentlemen, the day is still young. You will now have an opportunity for some discussion. I think it would be well to start the discussion on the last paper first, inamuch as that subject is, of course, now fresh in your minds. Is there any one who desires to say anything in regard to what has been said, or to make any additional remarks on the matter of foundations?

E. DREW GODDARD (City Engineer, Laporte, Ind.): I have some old macadam roads and it is desired to use that macadam road as it is for the foundation of a brick pavement. I heard a statement made in another engineering convention that trouble was experienced from the sand cushion working its way down through the macadam road. I want to know if that trouble is general.

CHAIRMAN DEAN: I think I shall call upon Mr. Tillson, being the expert on wood block paving.

GEO. W. TILLSON (Consulting Engineer to the President of the Borough of Brooklyn, New York, N. Y.): Mr. Chairman, this was a brick proposition as I understood it.

CHAIRMAN DEAN: Any paving; city paving.

MR. TILLSON: Mr. Chairman and Gentlemen: I should think that in such a case that if the macadam pavement were in reasonably good condition and were not likely to be disturbed after the brick were laid the old macadam would make a first-class pavement foundation. We have, I know, an asphalt pavement in the Borough of Brooklyn that was laid some fourteen years ago on a macadam foundation. It happened to be in a part of the borough where although the traffic was heavy there wasn't much digging up or disturbing of the base. We got excellent results from that. If your macadam is old and has been in use four or five years, so that it is thoroughly compacted, I do not see how any sand could get down into interstices of the macadam because the macadam must during that length of time, I should think, fill them absolutely full. The objection that I see to laying a brick pavement on a macadam foundation as it happened to be, is that the sand cushion would be uneven. That is, in some places you might have only ½ in. of cushion and in some places 1½ ins. If your macadam base were uneven I should want to bring it up to a reasonable surface with small broken stone rather than lay the sand cushion directly on the old macadam, so that the sand cushion might be as nearly uniform as possible over the entire surface.

CHAIRMAN DEAN: Has any one else any questions or remarks?

C. A. KENYON (President, Indiana Good Roads Association): In many places it is a constantly growing question what we are going to do with the worn-out macadam surface in order to put some other surface upon it, where the traffic, as has been the case over at Laporte, becomes too heavy for the macadam. I went over a number of roads with engineers in England last year and they had, I found, They do not lay much brick on old worn-out macadam, but they lay what they call durax. This is a small stone, which they can purchase from the quarries as they can stone they call tarred stone. The latter is stone mixed with thin tar so that it can be shipped and used cold. They don't adopted this form of construction to meet conditions there. have to have it heated as they do screenings or No. 2 stone.

They fill up some of the deeper depressions with that first, then tamp it down and then lay a seal coating on that; then lay the blocks on top of that with most excellent results. They were finding that in the cities where they had block pavements of wood and granite, the blocks under the heavy traffic of motor buses were being pushed into waves on account of the sand cushions underneath. They found that by putting these little binders, as the asphalt men call it, underneath either a granite or a wood block pavement, they absolutely stopped that waving motion from the heavy traffic afterwards. So by that little binder in the bottom, whether it is on an old macadam road or on a concrete foundation in the cities, this heavy traffic on the granite blocks or wooden blocks may be taken care of with very excellent results. (Applause.)

F. W. PATTERSON (The Cleveland Trinidad Paving Co., Cleveland, Ohio): The company I represent has laid many miles of resurfacing over macadam, brick and cobblestones, and other contractors have done the same. We have laid sheet asphalt, asphaltic concrete and other types. These seem to me to be the proper surfacings to apply on old foundations. So I thought I would bring that matter to your attention. I can refer to a number of pavements that have been laid by the company I represent. For instance, in Columbus, Ohio, there was a cobblestone pavement laid in 1904 with a sheet asphalt surface that has required no repairs. We gave a guaranty of five years, I believe, and during that time we were not called upon to make any repairs. So if there is any information any person wants about that question we shall be glad to answer it.

CHAIRMAN DEAN: The President has asked me to announce that at the close of the afternoon session today there will be a business meeting of the Association at which a matter of considerable importance to the Association may be acted upon. Are there any other gentlemen who would like to speak in regard to road foundations?

J. W. LOWELL (Universal Portland Cement Co., Chicago, Ill.): In building the levee alongside the stream which our boulevard embankment left it became necessary to remove certain obstacles from the stream and to obtain practically all our levee material from the stream proper. That material was of course more or less clean consisting largely of gravel running about 65 per cent. gravel and 35 per cent. sand. In the matter of the construction of this levee which, in a great many places, was 18 ft. deep, it became almost impossible as well as impracticable to try and roll this material when it was put down. Where you have a filling of loose material or attempt to build a gravel roadway on that surface and depth, running from 6 to 12 or 18 ft., you find a great deal of trouble in trying to get the proper foundation on which to secure a first-class gravel road quickly. Possibly some who have had similar experience might give us some suggestion that might assist us in this work. We have at the present time three miles of this roadway which we will soon commence to work on and get it finished.

CHAIRMAN DEAN: We will be glad to hear from some one else on this subject.

F. E. ELLIS (Manager, Essex Trap Rock & Construction Co., Peabody, Mass.): I was in Buffalo last Saturday and on one of their boulevards they were taking up a piece of water pipe or something and I noticed where they cut down for the trench that the road had been surfaced with sheet asphalt on the old macadam foundation. The parkway, when it was originally built, was built of water bound macadam and, I learned afterwards that about six years ago they surfaced it with sheet asphalt. That surface is in excellent condition and is in a great deal better condition than some of the roads near there that have been built of sheet asphalt on a concrete foundation.

W. F. SARGENT (Commissioner of Public Works, Oak Park, Ill.): Nothing has been said so far, I think, as to the use of an old sheet asphalt pavement as a foundation for laying another pavement. It happens that within the last few years we have built several miles of that pavement with what we think remarkably good results. I speak of this because during the past year I passed through the city and noticed that they were simply ripping out all the old asphalt and throwing it away, and it seems to me it is wasted.

MR. LOWELL: Mr. Chairman, stone drains in the side of the roads, having the tile at the bottom, were in our experience found not to be satisfactory or did not give results. Mr. Terrell made one explanation. I would like to have Mr. Johnston go into that further since that type of construction is uniformly used throughout the North and West to a great extent.

CHAIRMAN DEAN: I think Mr. Johnston would be very glad to elucidate a little more.

MR. JOHNSTON: Why, we opened up some of these drains and did not find them stopped with silt. It is possible, of course, some of them may freeze in the winter time, as Mr. Terrell suggests, but we do find that the same amount of money, that is to say, the cost of the drains, if that amount of money is put into extra base we get a surer result than we do with the side drains. If the water won't leak through the soil, it won't leak into your side drain. Mr. Terrell's point is that they don't get much frost, and there is no question but that that makes a great difference. If they did not have frost action down there, I don't doubt but that the drains were better. I don't mean to say that we have abandoned them altogether. If we are in a very wet place and we have got springs and water to be tapped and carried away, we use them. We do not use them as we might simply because we feel, as I say, that we are better off with the heavy foundation under the road than with the indirect method of side drains. The side drains would cost up to 50 cts. per running foot. We sometimes had them on both sides of the road. They cost $1.00 per running foot and $1.00 per running foot would add nearly a foot in depth to your foundation.

CHAIRMAN DEAN: This is quite interesting, gentlemen. Has some one else something to offer on this subject?

W. A. HEIMBUECHER (City Manager, University City, Mo.): I would like to ask Mr. Johnston how much rolling they do to the subgrade. I have found in my experience as a bridge contractor that where there is quite a bit of cutting in one place and light filling in in another, where they use a steam plow there is a tendency to cut heavy in spots and light in others and then they have to do the shaping with wheelers. Of course, that gives you a very unequal foundation and unless it is very thoroughly rolled, it is bound to fail later on. In the pavements I have looked over in my experience I have attributed the failures mainly to not rolling the subgrading and getting it into a hard condition. I would like to know if any one else has had any experience of that sort. I think the rolling of the subgrade is as of much importance as the placing of the concrete.

MR. JOHNSTON: We do roll subgrades, of course, but I sometimes think the necessity for that is somewhat exaggerated. That doesn't mean you shouldn't get the settlement out of your material, but oftentimes in a soft bottom it is almost impossible to roll it, particularly if the soil is sandy. Of course in that case the rolling isn't as necessary anyway for the sand can't compress it a great deal. But where there is to be a foundation on the subgrade it is the contractor's own loss. Our method is to pay for the stone in place in the road. Then it is up to the contractor. If he doesn't roll the subgrade and he loses the stone, it is his loss. He is paid for only a certain depth of stone in the road. He can take his own choice. If he thinks it is cheaper to put the stone in and let it sink out of sight into the soft bottom, he pays the bill.

CHAIRMAN DEAN: Has any one else anything to say on this subject?

W. P. COTTINGHAM (Assistant City Engineer, Gary, Ind.): At Gary and Steel City we are using iron ore slag from the blast furnace. We find that it makes an excellent base for anything you want. We put an asphalt surface on the old slag and we found in tearing that up that the slag had given us an excellent, well-bonded base, and there seems to be a chemical action in the slag. It is the same slag that is used in the manufacture of cement, and when it is rolled it works up and cements the material together on top of the base. The slag itself makes an excellent base for macadam and the county has used considerable of it.

CHAIRMAN DEAN: Are there any more comments?

MR. WHITE: I felt like saying just a word more on the use of old macadam for foundation. In Chicago here we have some examples of that, and one that I have particularly in mind is Michigan Avenue where the old macadam was used as a foundation for sheet asphalt. Between 12th and Jackson Streets there was an old macadam pavement over which asphalt was laid. This asphalt was in use—I am not sure just how many years—but I am sure it was over 12 years, when it was torn up because of the widening of the street—not that the macadam nor the asphalt was entirely out of service. At present there are several blocks of asphalt pavement on Michigan Avenue, particularly I will say between 12th and 16th Streets and between 18th and 22nd Streets, where the asphalt pavement is on old macadam, and these pavements are from 12 to 15 years old now, some of them. In recent years in the extension of the pavement on Michigan Avenue as well as on other Chicago boulevards, we have continued to utilize the old macadam base just as far as possible believing there was no economy in the destruction of a well-bonded macadam that had received the compression of years—no economy in taking that out and putting in concrete or any other sort of new base that we could devise. There are a great many miles of that sort of pavement in Chicago now carrying a bituminous wearing surface.

MR. LOWELL: I would like to ask Mr. White a question. Mr. White, isn't that more for boulevards than ordinary streets? I have in mind a pavement of that sort on Diversey Boulevard which was open to traffic of the heavier vehicles. I don't believe that has worked so successfully. I wondered if that practice wasn't more universal on boulevards than on other streets.

MR. WHITE: Yes, I think that is correct. I don't believe it is true that a macadam base will compare with a good concrete base for heavy traffic purposes and I should say it ought to be used for boulevards, residence streets, and comparatively light traffic streets, where the macadam would be of most value. I don't think that sort of a base is a suitable base for heavy traffic streets.

C. P. PRICE (Manager, American Tar Co., Boston, Mass.): Do you prepare the macadam for the asphalt base before you spread the asphalt?

MR. WHITE: Generally, yes. In some few cases it may be found the macadam is not in a suitable condition, but we generally consider that the macadam must be fairly even. There must be no considerable depression in it that would occasion a great deal of difference in thickness of the wearing surface or anything like that, and again we think the macadam must not have a dirty, fine grained dust appearance. We want the macadam to be rather clean so that the surface can get hold of it, so that the bituminous material can get a grip, as it were, on the base.

MR. ELLIS: I would like to ask Mr. White a question. Isn't the traffic on Michigan Avenue far greater than it would be on any of the state trunk line highways outside of the city?

MR. WHITE: Well, to a very large extent teaming traffic, that is, heavy trucking and that sort of thing, is excluded from such streets or boulevards as Michigan Avenue, but there is a certain amount of traffic of that character even, that necessarily goes over it for short distances. Also, traffic of course passes over the intersections without any restriction, and at many of these intersections the pavement receives not only the boulevard traffic but the heavier traffic of the cross streets. As to the intensity of the traffic on such a street as Michigan Avenue—by intensity meaning neither heavy nor light traffic, but a rapid traffic—hardly any comparison could be drawn. Of course, if you figure the number of vehicles and if you convert that into tonnage, Michigan Avenue unquestionably is carrying an extremely heavy traffic which I think hardly any highway considered as a suburban or a state highway would ever be called upon to bear.

MR. KENYON: Have you taken any census of the traffic on Michigan Avenue?

MR. WHITE: We have taken no census of the traffic this season—that is, for the year 1914. We have no complete census of the traffic. In 1913 there were certain portions of Michigan Avenue—say at about 16th Street, which is the dividing line between downtown and loop traffic and the more outer traffic—where it would range from 10,000 to 15,000 vehicles per day of 24 hours.

JOHN R. BENTLEY (Contractor, Cleveland, Ohio): In answer to the inquiry of the gentleman here as to laying brick pavement on an old macadam street, I might say that I laid one street in the city of Cleveland—15,000 yards on Euclid Avenue, one of our very heavily traveled streets—on a macadam base. The surface was not what it should have been. It was pretty well worn out, but we simply scarified it, leveled it and put on a 1½-in. cushion and laid the pavement. It went out of guarantee this year, and I didn't spend a cent on the guarantee except in two depressions that were caused by old box drains that had been put in before the macadam pavement went down. That was probably 15 years ago. The box drains were put in these and had finally settled and let the pavements down in two places.

I have enjoyed the papers very much and the discussions. There is one point that was brought out in one of the papers as to the distribution of the weight over the foundation which I take exception to. That is this: The gentleman contended that the distribution of the load of a 4-in. tire would radiate out 45 degrees, and consequently you could figure on that basis. I don't think that the engineers could figure on that basis. I think they should figure, not on the weak points, not on the general distribution of the travel, but they should take into consideration all the weak points in the street. That is the trouble with our pavements today. We have not been getting the foundations that we should have gotten. The result is, as was brought out in one of the discussions, that if there is a weakness it develops during the first year, or possibly the second, and you can go and repair it. Then you wouldn't have to figure on heavier construction because those defects could be taken care of as they developed. That is quite true, but the contractors are the goats. They are the fellows that have got to make the repairs and I think the time has come when the engineers and the contractors should get together and agree on the proper construction of the roads and pavements.

ROBERT J. H. WORCESTER (Superintendent of Roads and Bridges, Concord, Mass.): Regarding old macadam as a foundation, we have a stretch in the center of our town where sheet asphalt about 4 ins. thick on macadam and gravel has been down for about four years, and this stretch is right in the center of the business district and gets the through traffic between Boston and the western part of the state. On a Sunday afternoon this summer we took a census, and we counted 600 automobiles in one hour. We also get the farm traffic on the way to Boston, and all the teams coming to town and stopping in front of the stores. The maintenance charge on this stretch for the past four years has been about $40 for the one or two places that have settled.

H. W. DURHAM (Chief Engineer of Highways, Borough of Manhattan, New York, N. Y.): I just want to say a word in reference to the question of the foundation which I have heard brought out. It seems to me the type of foundation is very largely a local one. If you have under your pavement a class of material that will not settle or give in any way, whether you use old macadam or new, there is no necessity for a heavy foundation.

Something was said about street openings. Some years ago I had charge of the construction of pavements in the city of Panama, and that city is built almost entirely on a hard, almost rock-like clay so that any excavations could be made without bracing the sides. We found that with the exception of the principal streets where we put down a 6-in. foundation and on some of the minor but still important streets, where we put down a 4-in. concrete foundation, all under a brick surface, we got absolutely satisfactory results by building to the proper crown a foundation of macadam, formed in many cases by breaking up the old cobbles which had formerly paved the streets, crushing them and rolling them with a mixture of sand, or, in many cases, out of old broken brick that had been destroyed or damaged in shipping. There was no tendency to settle. We laid the brick directly over the sand cushion and that pavement has given satisfactory service for ten years.

Going over the roads and city streets that you find abroad as well as here, some of the best roads that are encountered, particularly in Europe, have absolutely no foundation other than the original surface beneath. On the other hand, those roads have existed for hundreds of years and are solid today. It is entirely a question to be studied in the light of local conditions, whether you have got to provide for settlement, or for soft material underneath. And on that basis you have got to decide how thick and what the nature of your foundation has to be. From the little experience I have had it has proven entirely possible that you can have a perfectly satisfactory pavement with moderately heavy traffic on a foundation of rolled macadam, not old material, but material put in place at the time of the paving.

M. F. BRAMLEY (President, Cleveland Trinidad Paving Co.): Mr. Chairman, and Gentlemen: I came here to listen to the many, various and varied speakers who were to address us today, nearly all having "C. E." after their names. We all know that in business we get some hard, common things knocked into us by reason of hard knocks and hard usage. I rise first to answer the question of the gentleman over here who asked Mr. White how to surface old macadam streets. We surfaced Jackson Boulevard in New York from the cantilever bridge or from the end of the pavement at the end of the cantilever bridge to Flushing Bay, an old macadam street, three years ago. In surfacing that we scarified every inch of it and where the macadam was low—the old macadam—we filled the space with stone about the size of a hickory nut and properly rolled it and the pavement is perfect today, and it is one of the most heavily traveled streets in New York City. We surfaced it with asphalt.

Surfacing with brick is handled a little differently. In Youngstown, Columbus and Cleveland where we surfaced with brick, the brick are properly cleaned, the joints are washed out and dried off and a coat of paint put on and then the surfacing put on top of that. Just as much care must be taken in surfacing old macadam with brick as there must be in surfacing old macadam with asphalt. You must have a true contour, a true shape and a true foundation. If your sand cushion is put in indiscriminately, 3 or 4 ins. thick in one place, and ½ in. in another, and there is less shrinkage away from the brick by reason of the unequal compression brought about, your grout won't hold, your brick will break under the big, heavy trucks, the bricks will get loose, and your entire pavement eventually will shatter.

I am somewhat grieved and surprised at the language used by the last able gentleman who addressed you who evidently is skilled in his vocation in life, and I presume any remarks made here will not be taken as personal, but rather along the line of argument and education. He said he laid streets in Panama without much of a foundation. The discussion here today, as I understand it at the present time, is on matters relative to foundations. We all attend these meetings and we hear various and varied remarks on the surfacing, on the asphalt and the brick; but you never hear much on the foundation of the pavement. Mr. Chairman, and gentlemen, to my mind, the most important problem in building pavements is the foundation.

Now, the gentleman—Mr. MacDonald, I believe—who was pointed out to us as the father of this organization, perhaps by reason of his age and his long experience remembers some time in his life when an engineer had some power in regulating and building pavements. He echoed that memory when he said to us here that certain residence streets are paved with business pavement and certain business streets are paved with residence pavement by reason of the pull of some local politician or some one. He also said that he thought this great force here ought to arise, or at least start something, that would bring back to the engineer his own—the right not only to make the plan, but to execute and conclude the plan as the architect does. I remember away back when we had an engineer in Cleveland whose name was Cyrus Force. He was very active and very aggressive in the preparation of plans, and not only the preparation but he had the right to award the contracts by reason of his power and his influence and his salary. The newspapers called him "Cyrus the Great." That was a great many years ago. The whole secret of road building will never be solved, the whole problem of foundation and surface and top and everything else involved in the building of roads and of highways and the building of pavements, will never be solved until all municipalities and until all political governing bodies leave to the engineer not only the power to prepare the plan, but the power to see that the plan is executed irrespective of the political gentleman who holds his job. (Applause.)

Now, while the father of this association made that slight remark, he apparently did it with hesitation. Is there any reason, Mr. Chairman, and gentlemen, why there should be any hesitation on that subject? Is there any reason why the engineers in convention assembled, or the road builders, or what not, or whatever you call this body, should fear to take the proper stand in a matter of this kind? The first thing for a concrete foundation or a stone foundation or a foundation for any pavement is a foundation of brains laid with power to execute and build according to well defined theories, and that foundation will never be started, the brain and the intellect will not be stimulated until the position of engineer is recognized above the other fellow, and the salary of the engineer is commensurate with the recognition from the foundation up. That is the first foundation, gentlemen, of a good pavement.

Why should we listen to these able papers? Why should this great convention adjourn itself and not say how thick a foundation should be? One man says it depends on local conditions; a very able gentleman from Massachusetts says in some sections gravel is cheaper and in some sections crushed stone is cheaper, and we must vary the foundation to fit the local conditions. Another gentleman gets up and sort of hesitatingly says the foundation is governed according to the wishes of the local people adjacent to the highways. I say, with all due respect to the gentleman that made that remark, that the foundation in his mind should first be planned, that he should recommend a proper foundation irrespective of the adjacent farmers on the road and irrespective of the parties who pay the bill. I say to you, Mr. Chairman and gentlemen, that I hope this convention, largely predominated by able engineers, representing the engineers and people of this great country, I say to you before this convention adjourns that I hope, for one contractor, that this great convention or the personnel of its make-up will have sufficient backbone to adopt a standard form of foundation to fit the various and varied conditions in the country and the city. There is absolutely no reason why the wishes of the adjacent farmers or the adjacent taxpayers should be consulted. There is absolutely no reason why the political boss or the ward boss, or the precinct boss should have any hand in saying how thick that foundation should be built.

Now, the able gentleman who read the first paper, Mr. White, said, as I remember, that there are only two classes of foundation, concrete and crushed stone. For the love of Mike, Mr. Chairman, if there are only two classes of foundation, concrete and crushed stone, isn't there sufficient backbone in the personnel of this convention or its engineers who ably represent it, to define how thick that concrete should be and its component parts, and how thick that crushed stone should be and its component parts? It is true we have cities, it is true we have countries in which to build pavements. There is no pavement, however, which is left undisturbed, and there is no pavement that should be built today in my opinion without a concrete foundation. Why, in our city of Cleveland, they dig holes everywhere. Every corporation in the city digs holes when it pleases and where it pleases, and they dump the dirt back in the hole and slop some water over it and you get an order to repair your street under maintenance, and the contractors foot the bills. We thought the county roads leading out through Cuyahoga County—and we have more miles of pavement perhaps than any other county in the country—we thought that they would be exempt from that kind of attack, and now we find that in that great county they have discovered gas, and they run gas pipes along the road, across the roads, and that in every conceivable direction, and there has been no disturbance of the pavements in any place where the foundation was of crushed stone or telford, but that every time they disturb the pavement, it is improperly put back and leaves a botch and eye-sore to the public and the public pays the bills.

I am going to try to end my discussion, Mr. Chairman and gentlemen, as quickly as possible, and not bother you further. I presume you all are hungry and some of you were up late last night. Mr. Chairman, I want to say in conclusion simply that this convention of the able men representing the whole country came here to the great city of Chicago not to simply be on a pleasure jaunt, but they came here representing not only their friends and the people who are interested in this great movement, but the engineers engaged in this construction all over the country. Gentlemen, can't you and won't you stand up here and tell us the character and form of general standard foundations? That is a task. If something else is to follow, that can perhaps take care of itself, but under all pavements of every kind and character, no matter what the brand of brick, no matter what the brand of asphalt, there should be a good solid and substantial foundation.

I thank you. (Applause.)

CHAIRMAN DEAN: Gentlemen, it seems too bad to close this discussion just at this interesting stage, but it is necessary in order to have time to get your luncheon before the afternoon session. There probably may be time later in the day, or tomorrow, to take up the subject where it is now left off. I want to say that the afternoon meeting will be in this same room at 2:30. The meeting now stands adjourned until half-past two.

THIRD SESSION, 2:30 P. M.

CHAIRMAN TILLSON: The first paper scheduled for this afternoon is "Organization of a State Highway Department," by Hon. John N. Carlisle, State Highway Commissioner of New York. (Applause.)

[Note.—Commissioner Carlisle's paper will be printed in the issue of February 6, in which the discussion on it will also be presented.—Ed.]

CHAIRMAN TILLSON: This completes the list of speakers on the program on this subject. As we have two more subjects this afternoon, and the day is getting on, I think it would be advisable to go on with the next subject. Then if we have time after the completion of the next two, we can discuss any of the three that are on the program for the afternoon. The next paper is "Traffic, Present Tendencies, Probable Development, and Regulation," by Mr. A. W. Dean, Chief Engineer of the Massachusetts Highway Commission. You were looking at Mr. Dean all the forenoon, so you will all recognize him when he comes to the front. (Applause.)

[NOTE: Mr. Dean's paper will be printed in the issue of February 6, in which the discussion upon it will also be presented.—Ed.]

CHAIRMAN TILLSON: The next gentleman to discuss this subject is Mr. W. W. Marr, Consulting Engineer of the Sheridan Road Improvement Association. Is Mr. Marr here?

If not, we will proceed to the next subject, "Machinery for Construction and Maintenance—State, Municipal, Contractors, Traction Haulage of Stone, Care of Machinery—Instructions to Engineers and Operator," by Mr. T. R. Agg, Professor of Highway Engineering, Iowa State College. Mr. Agg.

T. R. AGG: Gentlemen of the American Good Roads Congress: The topic that has been assigned to me covers the entire range of the selection and operation of road building machinery, entirely too wide a subject for me to discuss in its entirety. I have attempted only to open the discussion on this very important phase of road building activity.

MACHINERY FOR CONSTRUCTION AND MAINTENANCE —STATE, MUNICIPAL, CONTRACTORS, TRACTION HAULAGE OF STONE, CARE OF MACHINERY—INSTRUCTIONS TO ENGINEER AND OPERATOR

By T. R. AGG

Professor of Highway Engineering, Iowa State College

The wide range of machinery and appliances available for road and pavement construction makes advisable a careful selection for any particular class of work and yet many types of machinery are so much alike in general design that a selection must be based on a careful study of their operating characteristics. Probably there is no one best type for any given set of conditions nor any one best make of a given type, as a general rule. It is not within the scope of this paper to discuss the many kinds and varieties of good, bad and indifferent road building machinery, but it is proposed to discuss a few principles applicable to its selection, operation and maintenance.

Selection of Type of Machine

We find a group of machines available for earth road work, another for macadam construction, and so on through the various classes. These groups overlap to some extent.

Of the machinery offered for earth road work certain types such as the leveler are for a rather limited kind of work while others, such as the blade grader and elevating grader, are for more diverse uses. When a selection is to be made for a special work for which only one class of machine is made, one has only to choose the best bargains from the limited offerings of the class. But when machinery is to be chosen for more diverse uses, operating characteristics and adaptability must be considered. It will usually be found that the selection may be narrowed down to two or three makes and the final choice will depend upon price and personal preference.

The leveler has already been mentioned as an example of a specialized machine, and the mixer for concrete pavement construction is another. For this work it seems to be agreed that the traction type with boom delivery is the best. Of these, several makes are available and which to select will depend upon the purchaser's opinion as to the value and suitability of individual machines.

On the other hand the choice for earth road construction will be between the elevating grader and the blade grader and between traction haulage and team haulage and between the steam tractor and the gas tractor. Here the purchaser must decide between the classes first of all, and then between individual makes of the class.

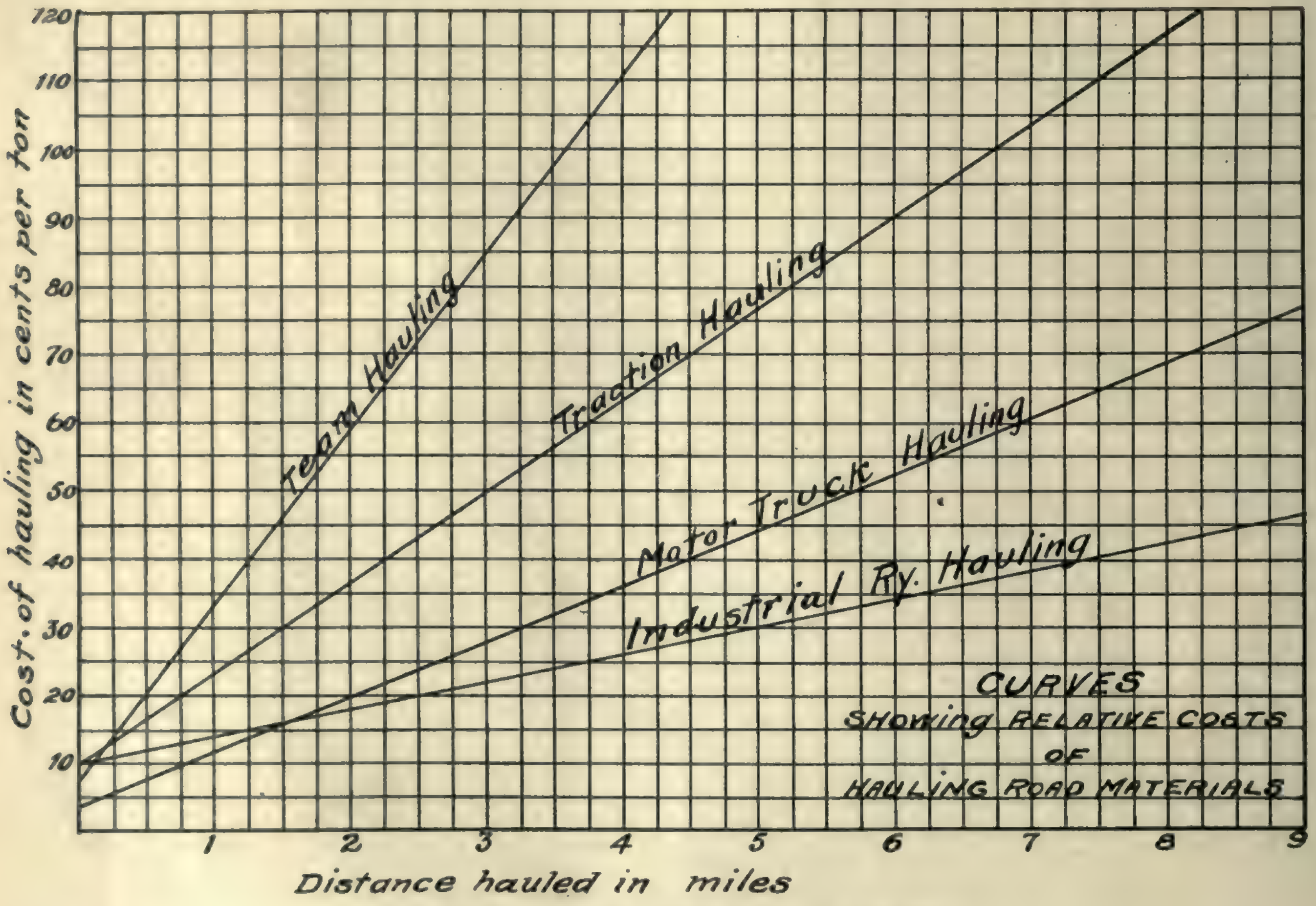


FIGURE NO. 1—RELATIVE COSTS OF HAULING.

This is typical of the machinery available for many classes of road work and the basis for a proper comparison is not easy to state. It is believed, however, that the following factors must be taken into account: (a) purchase price, (b) rate of depreciation, (c) maintenance cost, (d) cost of operation and (e) speed, all of which enter into the cost of doing work with any piece of machinery.

To properly estimate these factors there are at present but incomplete and contradictory cost data available and engineers and contractors can do a great service by giving publicity to any reliable and conclusive cost data that comes into their hands.

Purchase Price.—Some kinds of machinery will save their cost in comparatively short time and such may unhesitatingly be chosen because the user can readily foretell whether he has enough work ahead to make the investment profitable. Other kinds require a large outlay and must be used with reasonable regularity for a term of years before they will prove profitable. Eventually, if they can be kept busy they will pay; but before such machinery is purchased, there must be some assurance that the necessary work can be secured. It would often be cheaper in the long run to use a machine which operated at a higher unit cost, but which could be purchased at a much lower price.

Depreciation.—Depreciation is probably the most difficult factor to estimate because the carefulness of the operator has such a marked influence on the life of a machine. With most machinery the average life is fairly well established and hence depreciation can easily be estimated. This is a very important cost item and is probably more often placed too low rather than too high.

Maintenance.—The influence of maintenance on unit costs is well understood, and needs no special comment. Probably this item is also more often underestimated than overestimated. It should be borne in mind that maintenance cost really includes not only the charge for making repairs to a machine but also the cost of delay due to the idle time of the machine. When a large gang is working around a machine such as a concrete mixer any delay on account of the machine is expensive.

Cost of Operation.—The cost of operation for a machine should be taken from the average of many runs under normal conditions and not from exceptional runs made under the most favorable conditions. This cost will include the pay of all men needed to run the machine and the cost of all supplies regularly used in its operation.

Speed.—The rapidity with which a machine performs its work is a very important consideration not only from the standpoint of cost per unit of work done but from the impetus it gives to the entire job. This is particularly true in road and pavement construction where favorable weather conditions must be utilized.

Skill Required to Operate.—The skill required to operate a particular machine should be given consideration because expert operators are not always easily obtained and if a machine requires considerable skill in operation to produce the maximum output, its average may be low due to the difficulty of securing and retaining expert operators. Such machinery should usually be purchased only because of its marked superiority in other respects.

Adaptability.—Adaptability of a machine to various classes of work is an important consideration because it is rarely possible to foretell just where it will be used next and it is better to use a reasonably efficient machine continuously than it is to use a special and highly efficient machine for a certain kind of work and have it idle a large percentage of the time.

Having estimated as accurately as possible the various factors enumerated as above, preference should be given to the one type showing up the best.

The adoption of certain types of machinery for various classes of road work has been largely a survival of the fittest although on account of the new types that are continually being marketed, the process of weeding out is going on constantly. For most classes of highway work the preferred types are fairly well known and to enumerate them here would serve no useful purpose.

In rural communities, labor is usually scarce and the contractor in highway construction will find it to his advantage to utilize every machine that will facilitate his work even though it may not in all cases reduce his unit costs. In the long run, he will profit because of a greatly increased yardage for his season's output.

Methods of Hauling Road Materials

Those engaged in constructing roads and pavements have long realized what a large item of cost is incurred in hauling materials, and some discussion of the methods available is pertinent to this paper. Many factors involved in determining the cost of hauling are variable for work in different localities but for a given piece of work the amount of each of these can usually be selected with reasonable accuracy, and the economy of various methods thus compared.

The cost of hauling varies with the following factors:

1. Length of haul.
2. Rate of travel of the outfit used.
3. Amount of time lost at cars while loading and at road while unloading.
4. Amount of time lost on account of bad roads.
5. Capacity of the outfit per trip.
6. Cost of operation of the outfit.

Length of Haul.—Length of haul for a given piece of work is, of course, the same no matter what method of hauling is used.

Rate of Travel.—The rate of travel varies somewhat between outfits of the same kind and yet there is a value that is reasonably near an average for all outfits of a type. For teams 2½ miles per hour, traction outfits 3 miles per hour, motor trucks 10 miles per hour, and for the industrial railway 10 miles per hour may be taken as typical speeds, assuming half the distance is traveled empty and half loaded.

Lost Time.—The amount of time lost at cars depends upon the method of loading the outfit. If hand shoveling is resorted to the time will be relatively long but extra units of the outfit may be loaded while the others are on the road. This is advisable for all classes of hauling outfits and is a necessity in traction hauling and with the industrial railway. Bins at the sidings with capacity for a full load for the outfit may be used instead of extra units of equipment and are a necessity when the motor truck is used. For team hauling the loading chute may be employed instead of extra wagons. In any case time lost at the cars is expensive, especially on short hauls, and should be eliminated as far as possible.

Records of loss of time in loading and in unloading are exceedingly diverse, but the following amounts lost per trip are near enough the average to give comparable results: With team hauling 18 minutes, motor trucks (loaded from bins or hoppers), 6 minutes, traction outfits, 30 minutes, and with the industrial railway, 30 minutes.

Time lost due to the condition of the road cannot be evaluated in a discussion like this because it varies throughout the season, differs with the locality and with the kinds of roads over which the hauling must be done. It is the greatest with the traction outfit, is about the same for team and motor truck hauling and is a negligible factor for the industrial railway.

The capacities of these outfits per trip are also exceedingly diverse and perhaps no particular one is typical, but equipment of the following capacities are in common use and will serve as examples: Wagons for team hauling, 2 tons; motor trucks, 5 tons; traction outfits, 15 tons; industrial railway trains, 20 tons.

The cost of operation of each of these outfits will vary with the skill of the superintendent, the character of the operator, the kind of weather encountered and the nature of the road that is used. Cost of operation should include the following items: Interest on investment; depreciation on outfit; maintenance of outfit; fuel, oil and other supplies used, and labor cost of operation.

These various items must be evaluated in estimating the cost per hour for operation, and a careful study of the subject has led to the assignment of the following values: Cost of operation per hour for teams $0.50, for motor truck $2.00, for traction outfit $3.00, for industrial railway $4.00. If any inequalities exist here they will of course change the entire relation, but the method of comparing costs of hauling as outlined is applicable and that is the principal object of this discussion.

Knowing the relation that exists between these various factors that enter into cost of hauling an equation may be written to show the cost per ton which is as follows:

$$C = \frac{rd}{us} + \frac{Tr}{u}$$

where

C=cost per ton for a length of haul$=\frac{d}{2}$

d=distance in miles traveled per round trip.

u=number of tons hauled per trip.

s=speed of vehicle in miles per hour.

T=time lost loading plus time lost unloading.

r=cost of operation in dollars per hour.

If, in the general expression given above, we insert the values of the various factors for each method of hauling we get the unit cost of hauling by that method for any length of haul $\frac{d}{2}$.

These are as follows:

$C=0.1\,d+0.075$, for team hauling.

$C=0.04\,d+0.04$, for motor truck hauling.

$C=0.666d+0.10$, for traction hauling.

$C=0.02\,d+0.10$, for industrial railway hauling.

For convenience of comparison the unit costs for various lengths of haul have been computed and the diagrams in Figure No. 1 constructed. It is easy to see at a glance the most economical method for any length of haul. If the assumed values of the various factors are in any case inapplicable to a given set of conditions the proper ones may be selected and similar curves drawn for use in comparing the costs for these conditions.

It is also convenient to know the capacity of these various outfits per working day and the diagrams in Figure No. 2 have been drawn to show the amount of material each outfit will deliver per hour and per day when working under the assumed conditions.

The important thing in this discussion is not the relative costs shown by these diagrams but the possibility of reducing to definite data the probable costs for any piece of work, thus obtaining a basis for determining which method to use.

In all of this discussion one factor has of necessity been omitted which is of greater importance than any other and that is the personality of the superintendent. One man fails to make certain equipment pay out and another succeeds in accomplishing remarkable results with it. Two sets of cost data are obtained, the one showing abnormally high costs, the other showing costs that are exceedingly low. No general discussion can ignore these facts but they cannot be put into data for use in average cases.

Instruction to Engineers

States, municipalities and a few construction companies seek to insure that no engineer in their employ will allow the organization of which he is superintendent to fall below the average in efficiency. To that end instructions regarding the use and capacity of various kinds of machinery and as to methods of organization are furnished. Some of these manuals of instruction are excellent treatises on highway construction. Three phases of the use of machinery are usually presented and these cover the normal requirements of such instruction.

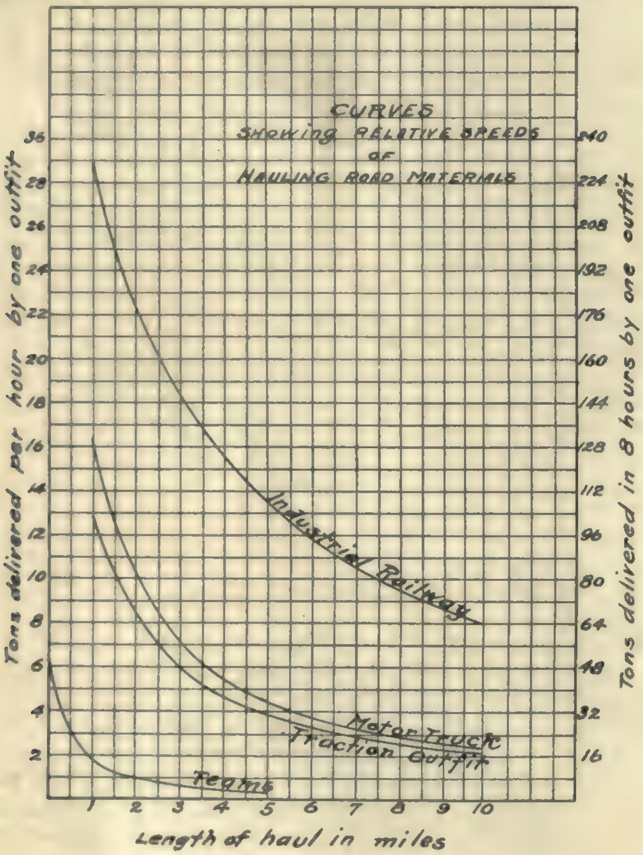


FIGURE NO. 2—RELATIVE HAULING SPEEDS.

The general organization of the work is first outlined. Ordinarily some one machine or operation is the pacemaker for the whole job and when that is true the engineer in charge of construction must build up his whole organization about that machine or operation. The instructions can outline a workable organization but the live engineer will usually be able to improve upon the details.

The instructions next deal with the capacities of machines, rate of construction that can be attained and quality of work that should result. Such matter serves admirably as a yard stick by which the engineer may measure his efficiency. Here again, a man's personality will often enable him to do much better than the average set down in the instructions.

And finally the instructions deal with reports, cost data and records of progress that are required. In this respect the instructions will be specific and lay down exact requirements.

Instructions to engineers are not, nor can they be, a series of exact rules that must be folowed, because no one can foresee all phases of the multitude of detail that enters into the prosecution of construction work and competent engineers would be hampered by instructions that attempted to prescribe exactly how each machine should be utilized

Instruction to Operators

In the widespread use of costly machinery there always lies the danger of loss through incompetent operation. Delays due to breakdowns are costly and often avoidable. Here again many states and municipal organizations seek to avoid trouble by furnishing to machine operators complete instructions.

These instructions deal first of all with the operation of the machine and since the work is largely mechanical though skilled, the instructions can say in detail just how the machine is to be handled. Here minute instructions are justifiable and they would include besides suggestions on operations, others on the care of the machine, the making of repairs, methods of adjustments and renewals of working parts.

The matter of personal conduct should also be dealt with in these instructions since the public often obtains its impressions of a department by the conduct of some irresponsible subordinate.

The construction of highways involves the handling of much bulky material and consideration of efficiency and economy requires that the machinery shall be well adapted to the work for which it is used, that the operations be systematized so that each machine will produce to capacity, that the machinery shall be handled in an intelligent manner so as to have normal life, and that the problem of transportation be studied in all its relations before a system is adopted.

CHAIRMAN TILLSON: The next name on the program is of Mr. R. C. Watts, in charge of equipment, Ohio State Highway Department. Is Mr. Watts present?

The next man is Mr. F. L. Cranford, Road Contractor, Brooklyn, New York. Is Mr. Cranford present?

Mr. Ransome Rowe, Contractor, Boston, Mass., is the next man. Is Mr. Rowe present?

Mr. Thomas H. Gill, Binghamton, N. Y., is next. Is Mr. Gill present?

Mr. Joseph Walker, President of the J. Walker Construction Company, Albany, N. Y. Is Mr. Walker present?

There doesn't seem to be any more we can get to present discussions on this subject, but before any one goes out I want to call your attention to the banquet that is to be given at the Hotel La Salle this evening at seven o'clock. The tickets, if there are those who have not obtained them, can be obtained down in the arena at the registration booth, or at the hotel, for three dollars each.

Now, all of these papers, the three papers that have been presented, are open for general discussion. Has any one anything to say on these papers? If so, we will be glad to hear from him. If there is no discussion on any of these papers, we will proceed with the business meeting of the Association, to which attention was called by Mr. Dean this morning. Of course all matters that come up at this meeting will be voted upon only by those who are members. Has any one anything to present at the business meeting?

Business Meeting

MR. DEAN: Mr. Chairman, in past years it has been the custom to appoint a nominating committee on the last day of the convention. This has caused a great deal of difficulty for the nominating committee, in that it had to do a great deal of its business by correspondence. Therefore, I recommend that a nominating committee be appointed at this time instead of on the last day of the meeting, and I nominate the following gentlemen: Mr. R. A. Meeker, New Jersey; Mr. F. E. Ellis, Massachusetts; Mr. C. A. Kenyon, Indiana; Mr. W. G. Leininger, Illinois; Mr. G. A. Nelson, Alabama; Mr. W. S. Gearhart, Kansas; Mr. W. D. Uhler, Pennsylvania.

MR. CROSBY: I second the motion.

CHAIRMAN TILLSON: Are more than two of these from the same state?

MR. DEAN: No, sir.

CHAIRMAN TILLSON: The constitution requires that there shall not be more than two from one state. You have heard the motion. Is there any discussion?

It has been moved and seconded that these names as read by Mr. Dean be made the nominating committee to nominate officers for the ensuing year. Is there any discussion? If not, all those in favor of the motion will manifest it by saying aye; opposed, no. The motion is carried.

Is there any other business to come before the meeting?

MR. CROSBY: I move that we adjourn.

MR. DEAN: I second the motion.

CHAIRMAN TILLSON: It has been moved and seconded that we do now adjourn. All those in favor of the motion will manifest it by saying aye; opposed, no. The motion is carried, and the meeting will stand adjourned.

Thursday, December 17.

FOURTH SESSION, 10:30 A. M.

CHAIRMAN PARKER: Gentlemen, in the absence of the President of the Association I have been requested to preside today. The discussion today is upon brick roads and streets, to begin with, and Mr. John Laylin, Division Engineer of the Ohio State Department, is going to read to you a paper which will later be discussed, Mr. Laylin. (Applause.)

[Note: Mr. Laylin's paper will be printed in the issue of February 6, in which the discussion following it will also be presented.—Ed.]

[Note: During the discussion of Mr. Laylin's paper, the following matters were interpolated.—Ed.]

NELSON P. LEWIS: I would like to ask the members of the Committee on Resolutions to gather here for a brief meeting immediately after this morning's session. They are, besides myself, Mr. Sargent, Maj. Crosby, Mr. Dean, Mr. Hirst, Dr. Pratt, Mr. MacDonald of Iowa, Mr. MacDonald of Connecticut, and Mr. Foster.

E. L. POWERS: Mr. Chairman, I have a communication I would like to read. It is from Mr. E. H. Lee, of Chicago, President of the Western Society of Engineers:

Mr. E. L. POWERS, Secretary,
American Road Builders' Association,
In Convention, International Amphitheatre,
Chicago, Ill.

Dear Sir: On behalf of the Western Society of Engineers, I wish to extend to your convention the privilege of our society rooms at 1735 Monadnock Block, corner of Dearborn and Van Buren Streets. We trust that members of your convention will feel free to make use of our rooms as downtown headquarters.

With best wishes for your continued success in this work. I am,

Yours respectfully,
(Signed) E. H. LEE,
President.
By J. H. WARDER,
Secretary.

CHAIRMAN PARKER: Now, gentlemen, I am sorry to cut this discussion short, but we have got to do it, because you have now the subject of "Surfaces or Floors for Bridges," which has to come in before the afternoon session, and I believe the discussion of it will have to be put over until the afternoon. Mr. Clifford Older, Bridge Engineer of the Illinois State Highway Commission, will present this subject to you.

[Note: At this point Mr. Older gave a brief resume of his paper, "Surfaces or Floors for Bridges." The paper will be printed in "Good Roads" for February 6, in which the discussion of the subject will also be presented.—Ed.]

CHAIRMAN PARKER: Mr. Powers has another announcement that he wants to make.

MR. POWERS: Several of the delegates and visitors have mentioned to me their desire to visit the Stock Yards. I asked the management to send a representative over here to extend us a formal invitation and arrange a time. As yet he has not shown up. I have been expecting him every moment.

CHAIRMAN PARKER: Then we will pass that. Gentlemen, the discussion of this last paper will begin at 2:30 this afternoon. With that I will declare this meeting adjourned.

FIFTH SESSION, 2:30 P. M.

PRESIDENT McLEAN: Gentlemen, please come to order; the time has come for opening our afternoon session. The discussion of the last paper, on bridge floors, will be the first matter taken up this afternoon, and I will ask Mr. John R. Chamberlin, Deputy in Charge of Bridges, Ohio State Highway Department, to open the discussion. Mr. Chamberlin.

[Note: As previously noted, this discussion will be presented in the issue of February 6.—Ed.]

PRESIDENT McLEAN: As we have trespassed on our time this afternoon in order to dispose of the discussion on bridge floors, I believe that you will agree with me that further discussion from the floor is perhaps not advisable. I will ask that the afternoon's program be now proceeded with as shown in the printed program.

The first paper is on "Bituminous Construction and Maintenance—Recent Practice," by William D. Uhler, Principal Assistant Engineer of the Bureau of Highways and Street Cleaning, Philadelphia, Pa. Mr. Uhler. (Applause.)

[Note: Mr. Uhler's paper, "Bituminous Construction and Maintenance—Recent Practice," will be printed in the issue of February 6, in which the discussion on the paper will also be presented.—Ed.]

PRESIDENT McLEAN: Time is passing and we have on the program a paper on concrete roads. I believe that the discussion on the subject of bituminous construction and maintenance may be postponed until the end of the afternoon, when we can return to it, if time permits. In order that no injustice may be done to those who have prepared papers, I will therefore continue with concrete roads, and in the absence of Mr. Kuelling we will ask Mr. Hirst to read the paper, "Concrete Roads," prepared by Mr. H. J. Kuelling, County Highway Commissioner of Milwaukee County, Wisconsin.

A. R. HIRST (State Highway Engineer of Wisconsin): Mr. Kuelling is the County Highway Commissioner of Milwaukee, the Cook County of Wisconsin, where there has been constructed in the last three years about fifty miles of concrete highway. I believe that Milwaukee County now stands second in the United States in the mileage of concrete roads.

Mr. Uhler mentioned the fact that we should mention our failures. As a matter of fact, we built in Milwaukee County six miles of concrete the first year, a portion of which was almost a complete failure, due to the fact that we used dirty gravel. Mr. Kuelling unfortunately has recently had appendicitis and is unable to read the paper which, however, he did prepare.

[Note: Mr. Kuelling's paper, "Concrete Roads," will be printed in the issue of February 6, in which the discussion on concrete roads will also be presented.—Ed.]

PRESIDENT McLEAN: Before throwing the discussion open to the house I wish to tell you that an invitation will be extended to the members of this Association to go through the Stock Yards. It is probable that the time will be between twelve and two o'clock tomorrow, but the invitation will be extended when the session opens at ten o'clock in the morning and the hour will be fixed at that time.

There will be a meeting this evening, in Room No. 808 at the Hotel La Salle, of the Board of Directors.

Through some oversight or some uncertainty as to the Committee on Credentials having been appointed, I will ask the Secretary to announce the names which were intended to be included.

SECRETARY POWERS: A. M. Jackson, J. M. McCarthy, P. C. McArdle, R. Keith Compton, Frank F. Rogers, H. W. Durham and E. D. Brian.

PRESIDENT McLEAN: If that committee will arrange to meet any time after the present, so that they may report, I will ask Mr. Jackson, the Chairman, to receive the other members in the room adjoining.

Now, we are free to return to the discussion from the floor on the subject of bituminous construction for a short time. Gentlemen, the subject is open. Don't hurry. This is an interesting subject.

As no one apparently desires to ask questions or make any statements, we will turn to the subject which we have just had under consideration, concrete roads. Is there any discussion from the floor on that subject?

[Note: As previously noted, this discussion will be presented in the issue of February 6.—Ed.]

PRESIDENT McLEAN: Gentlemen, there is room for extremely interesting discussion, but, unfortunately, the time has come when we will have to resolve ourselves into the business session, as announced. I hope that all the members of the American Road Builders' Association will stay for that session.

Business Session

PRESIDENT McLEAN: The reports of the committees are in order. The first report will be that of the Committee on Standards, Mr. N. P. Lewis, Chairman. Is Mr. Lewis here?

MR. DEAN. Mr. Chairman: Mr. Lewis had to leave, but he left his report with me and I handed it to the Secretary.

PRESIDENT McLEAN: The Secretary will kindly read the report.

[Secretary Powers then read the report, which follows:]

Report of the Committee on Standards

To the American Road Builders' Association:

Gentlemen: Your Committee on Standards, which was appointed at the Philadelphia Convention, submits the following progress report:

The Committee organized for its work by the appointment of sub-committees upon the following subjects:

1. Field tests for materials used in street and highway construction, which tests may be made on the ground by superintendent and inspectors.
2. Specifications or instructions for the building of earth and gravel roads.
3. Specifications or instructions for the building of sand-clay roads.
4. Specifications or instructions for inspectors and foremen engaged in maintenance and repair work.
5. The care of the roadside.
6. Dust preventives.
7. Traffic standards.

As the members of your Committee are widely scattered, from New York to California and from Michigan to Texas, it has been impossible for the Committee to have a meeting since the Philadelphia Convention, but the sub-committees were so arranged as to group together in each committee members who were as conveniently located as possible with respect to each other. Nearly all the sub-committees have submitted reports, some of which are brief, and others are quite voluminous. The Committee, as a whole, has had no opportunity to condense these various reports and combine them in a single report of the Committee.

We recommend that the Committee be continued; that it submit its report to the Annual Meeting to be held in February, and that, if the Association so directs at that Annual Meeting, its report be printed in the proceedings of the present convention, so that it may be available for all members of the Association; that comment and criticism be invited from the membership and that the Committee submit a final report at the next convention, at which time the Association, after an opportunity for discussion, may take definite action upon the recommendations of the Committee.

Your Committee feels that the Association should only adopt standards for the various divisions of highway work above outlined after careful deliberation and thorough discussion, and that the Association should not be asked to pass finally upon such standards until the report of the Committee shall have been before the members for a sufficient time to permit such careful consideration and criticism.

Respectfully submitted,

(Signed) NELSON P. LEWIS, Chairman.

[The Committee on Standards consists of Nelson P. Lewis, Chief Engineer, Board of Estimate and Apportionment of New York City, Chairman; H. L. Bowlby, State Highway Engineer of Oregon; A. W. Dean, Chief Engineer, Massachusetts State Highway Commission; A. B. Fletcher, State Highway Engineer of California; S. D. Foster, Chief Engineer, Pennsylvania State Highway Department; C. A. Kenyon, President, Indiana Good Roads Association; W. A. McLean, Chief Engineer of Highways and Commissioner, Ontario Public Roads and Highways Commission; R. J. Potts, formerly Professor of Highway Engineering, Agricultural and Mechanical College of Texas; Dr. Joseph Hyde Pratt, State Geologist of North Carolina; F. F. Rogers, State Highway Commissioner of Michigan, and Geo. W. Tillson, Consulting Engineer to the President of the Borough of Brooklyn, New York, N. Y.]

MAJ. CROSBY: Mr. President, I move the report be adopted.

MR. MEEKER: I second the motion.

PRESIDENT McLEAN: You have heard the motion. It is moved and seconded that the report be adopted. Any discussion? All those in favor of the motion will say aye. Opposed no. The motion is carried.

The next will be the report of the Committee on Legislation.

[Secretary Powers then read the report of the Committee on Legislation, which follows:]

Report of the Committee on Legislation

To the American Road Builders' Association:

Your Committee on Legislation begs to report that, in pursuance of its instructions, a study of road laws has been made, and a tentative statement of principles, based thereon, has been prepared. Your Committee, however, is of the opinion that further investigation should be made before a final report is presented to or adopted by this Association; and authority is desired to present such report for discussion or adoption at the next anual meeting, when publication may, if then deemed advisable, be authorized in the report of that convention.

(Signed) W. A. McLEAN, Chairman.

[The Committee on Legislation consists of W. A. McLean, Chief Engineer of Highways and Commissioner, Ontario Public Roads and Highways Commission, Chairman; A. R. Hirst, State Highway Engineer of Wisconsin; A. N. Johnson, Highway Engineer, Bureau of Municipal Research, New York, N. Y.; E. L. Powers, Editor, "Good Roads," and Dr. Joseph Hyde Pratt, State Geologist of North Carolina.]

PRESIDENT McLEAN: You have heard the report.

MR. DEAN: I move the report be accepted and the recommendations adopted.

MAJ. CROSBY: I second the motion.

PRESIDENT McLEAN: You have heard the motion, gentlemen. All in favor of the motion say aye. Opposed, no. The motion is carried.

The next item on the program is the report of the Committee on Resolutions. The Secretary will please read the report.

[Secretary Powers then read the report of the Committee on Resolutions.]

PRESIDENT McLEAN: You have heard the report. What is your pleasure?

[After some discussion regarding the exact wording of the resolutions and a slight amendment thereof, the following resolutions were adopted:]

Report of the Committee on Resolutions

RESOLVED, That the A. R. B. A. expresses its appreciation of the cordial welcome extended to it by His Excellency, the Governor of the State of Illinois; His Honor, the Mayor of Chicago, and the Association of Commerce of the City of Chicago—a welcome, the sincerity of which has been evidenced by the many courtesies we have received at their hands.

RESOLVED, That the A. R. B. A. extends its sincere thanks to the state, county and city officials, the commercial organizations of the city, the Western Society of Civil Engineers and the different organizations which are devoting their attention to road improvement, for the many courtesies extended by them, all of which have contributed so conspicuously to the enjoyment and profit of those in attendance at this convention.

RESOLVED, That the A. R. B. A. expresses its keen appreciation of the kindness of the Saddle and Sirloin Club in extending to us the courtesies of its club and the use of its rooms during the convention.

RESOLVED, That the A. R. B. A. hereby expresses its appreciation of the valuable cooperation of the manufacturers, states, cities, colleges and all others who have, by their excellent exhibits and efforts, contributed so greatly to the value and instructiveness of this convention.

RESOLVED, That the A. R. B. A. extends its hearty congratulations to the State of Illinois, Cook County, and the City of Chicago upon the great popular interest which is being shown by the public in the subject of road improvement, and upon the substantial progress which is being made in that direction; and that the Association wishes them abundant success in the wise planning and efficient execution of these improvements.

[The Committee on Resolutions consisted of Nelson P. Lewis, Chief Engineer of the Board of Estimate and Apportionment of New York City, Chairman; Paul D. Sargent, Chief Engineer, Maine State Highway Commission; Major W. W. Crosby, Consulting Engineer, Baltimore, Md.; A. W. Dean, Chief Engineer, Massachusetts State Highway Commission; A. R. Hirst, State Highway Engineer of Wisconsin; Dr. Joseph Hyde Pratt, State Geologist of North Carolina; T. H. MacDonald, State Highway Engineer of Iowa; James H. MacDonald, formerly State Highway Commissioner of Connecticut, and S. D. Foster, Chief Engineer, Pennsylvania State Highway Department.]

Friday, December 18.

SIXTH SESSION, 10:30 A. M.

CHAIRMAN MEEKER: Gentlemen, if you will come up toward the front we will make an announcement out of the regular line of business. As you know, yesterday a tentative invitation was sent to the members of this convention to visit the Stock Yards and the members were further informed that guides would be furnished to take them through the Stock Yards. Mr. J. R. Hills is here representing the Stock Yards Association and also Swift & Co. He will now give you this invitation in detail and tell you what to do and where to go and what there is for you to see. (Applause.)

[Note: At this point Mr. Hills extended to the convention an invitation to inspect the plant of Swift & Co.]

CHAIRMAN MEEKER: Now, gentlemen, you have heard the invitation of Mr. Hills and I will leave it to the members individually to decide what they want. You may form little parties of your own to go down there, or, if you simply wish to go singly or by twos Mr. Hills will be around here. You can decide among yourselves what you want to do about visiting this great industry that has made Chicago famous.

The first paper this morning on "Recent Practice in Construction in Wood and Granite Block" is by William A. Howell, Engineer of Streets, Newark, N. J. Mr. Howell is not present and therefore I will call on Mr. R. H. Gillespie, Chief Engineer of Sewers and Highways, Borough of the Bronx, New York, N. Y., to read the paper.

[Note: The paper on "Recent Practice in Construction in Wood and Granite Block," by Mr. Howell, will be printed in the issue of February 6, in which the discussion upon it will also be presented.—Ed.]

CHAIRMAN MEEKER: This is a very interesting subject and has been presented to you in a most edifying manner and I would be very glad to throw this question open for discussion. But as the hour is getting late and many of the members wish to visit the Stock Yards we will defer any open discussion of this matter and take up the next subject, "Present Practice in Earth and Gravel Road Construction and Maintenance." This paper will be presented by Professor Ira O. Baker, of the University of Illinois, who is known to every road engineer, if not personally, at least through his works. Professor Baker. (Applause.)

[Note: Professor Baker's paper, "Recent Practice in Earth and Gravel Road Construction and Maintenance," will be printed in the issue of February 6, in which the discussion following it will also be presented.—Ed.]

[Note: During the discussion on Prof. Baker's paper, the following was interpolated in the proceedings.]

CHAIRMAN MEEKER: Gentlemen, I have a telegram from our former President, Samuel Hill, to this convention.

> Convey to Convention assurance of my best wishes for successful meeting. This is the first time I have failed to attend a meeting, reason being the pressing needs of Belgian friends. Am chairman of the Oregon Belgium Relief Committee and felt my duty here. My heart is with you and my disappointment at not being there in person is great, and much greater than I can express.
>
> SAMUEL HILL.

CHAIRMAN MEEKER: Mr. Thomas H. MacDonald is not here to read his paper on "Street Paving in Small Cities," but has handed it to the Secretary. It will, therefore, be printed in the proceedings.

I wish to announce at this time that the convention will go into executive session at the conclusion of this afternoon's session. It is a business meeting of the American Road Builders' Association. I further announce that the nominating committee will meet at this room at two o'clock. The meeting for this afternoon is called for half-past two, but I doubt whether we can assemble at that time. I will now declare this morning's session adjourned.

SEVENTH SESSION, 2:30 P. M.

CHAIRMAN CROSBY: Gentlemen, the hour for the meeting has arrived and more than arrived. At the morning's session because of the limited time we were unable to reach the topic of "Street Paving in Small Cities." The paper on this subject by Mr. MacDonald of Iowa has been received and will be printed, but in order to save time and as Mr. MacDonald is not present I will call on or ask for the discussion to proceed at once. The first gentleman on the list for the discussion is Mr. Boley, of Wisconsin. Is Mr. Boley present? Is Mr. Cairns of Waterbury, Connecticut, here? Is Mr. Anderson of Illinois here? Is Mr. Hunter of Pennsylvania here? Apparently not.

Now, discussion from the floor is in order and any gentleman who cares to speak upon this subject I am sure the convention will be very glad to hear. I understand that some discussion had practically been promised. I hope that it will be forthcoming. The subject is an interesting one.

If there is no discussion we will proceed with the regular program of the afternoon. The first topic is "Convict Labor in Road Construction." This is a very interesting subject to a great many of us, I am sure, and the paper listed is a paper by Mr. T. J. Ehrhart, State Highway Commissioner of Colorado. I regret extremely that Mr. Ehrhart is not here because Colorado has had some very interesting experiences in convict labor. The man I relied on to read the paper has disappeared, so with your permission the Chair will make the attempt.

[Note: Commissioner Ehrhart's paper will be printed in the issue of February 6, in which the discussion on the subject of convict labor will also be presented.—Ed.]

CHAIRMAN CROSBY: There is one other subject on the program, that of "Dust Prevention and Street Cleaning," and unless there is some serious objection or some important point to be brought up of general interest on the question of convict labor, I will call for the speaker on the next subject. The subject was assigned to Mr. Chas. O. Davis, Superintendent of Street Cleaning, of Milwaukee. He was unable to attend the afternoon session, and I will therefore ask Mr. Wm. H. Connell, Chief of the Bureau of Highways and Street Cleaning, of Philadelphia, to present a few facts in the matter. Mr. Connell has had considerable experience in the third largest city of the country and is entirely competent, and I am sure you will agree with me when you have heard him.

[Note: Mr. Connell's discussion of dust prevention and street cleaning will be printed in the issue of February 6, in which the discussion following it will also be presented.—Ed.]

CHAIRMAN CROSBY: The formal program is concluded, and the business meeting of the Association is scheduled to follow. It will be called immediately by the President, but before you adjourn, one or two brief announcements should be made. One is that a road convention and exhibition will be held in Toronto under the auspices of the Dominion Highway Association and the Ontario Good Roads Association, in March. A cordial invitation is extended to all present, and their friends, to attend. An invitation has been received from the Mayor of Buffalo and the Buffalo Chamber of Commerce to hold the next convention of this Association in that city. We received this morning, a letter from the Secretary of the British Road Board. It reads:

PERMANENT INTERNATIONAL ASSOCIATION OF ROAD CONGRESSES.

Local Organizing Committee, London Congress, 1913.
December 2d, 1914.

Dear President McLean:

I should be very glad when opportunity offers if you would convey the good wishes of the road builders of England for a very successful convention at Chicago.

We watch with the greatest sympathy and interest the efforts of the road builders of North America to solve the huge problem of providing your country with an adequate network of well constructed and efficiently maintained trunk roads.

I often wish that I could take a little more active part in your work, and live in hope that I shall be able to visit you again shortly, if only to travel over the great road which I believe you are trying to construct to connect the Atlantic with the Pacific Ocean.

With every good wish, believe me,

Yours sincerely
(Signed) W. REES JEFFREYS.

President W. A. McLean, American Road Builders' Association, Hotel La Salle, Chicago.

I am sure the sympathy and good wishes of the British association are appreciated by this Convention. If there is no further business before the Convention, the Chair will declare the meeting adjourned. We will now proceed to the business meeting of the Association, if you please.

Business Session

PRESIDENT McLEAN: The first matter, I believe, is to receive the report of the Committee on Credentials, Mr. A. M. Jackson, Chairman.

ALAN MAIR JACKSON: Mr. Chairman, and Gentlemen: I beg leave to submit the report of the Committee on Credentials.

Report of the Committee on Credentials.

The Committee on Credentials has been unable to hold a meeting, so as Chairman I have taken the responsibility of going through the very excellent system of registration adopted by our most painstaking and competent Secretary, Mr. Powers. As a result of this investigation of the registrations, I am proud to report that almost four thousand registrations have been made, making a very gratifying record. Of course, you will understand an absolute count of the registrations cannot be made at this stage, as people are still registering. I may say that forty-seven states of the Union are represented together with nearly 100 representatives from Canada, from eight provinces. Six foreign countries have been represented: namely, Scotland, Cape Colony, South Africa, Hawaii, the Philippines, Hungary, and Buenos Ayres, South America.

I think, gentlemen, the representation from the United States and Canada, showing as it does delegates from 55 out of a total of 59 states and provinces, is a record of which the Association and its President may very justly be proud. Moreover, this almost complete representation of the North American continent is supplemented, as I have said, by representatives from, I was going to say, the four corners of the earth, only in this case, from six corners of the earth, and those all very distant ones.

I feel sure the Association will feel proud with Mr. McLean, your President, of the representation from Canada, a great many of whose delegates have traversed considerable distances to be present.

I have the honor to be, sir, your obedient servant.
ALAN MAIR JACKSON, Chairman.

[The members of the Committee on Credentials were Alan Mair Jackson, Brantford, Ont., Chairman; J. M. McCarthy, Secretary, Massachusetts State Highway Commission; P. C. McArdle, Acting Chief State Highway Engineer of Illinois; R. Keith Compton, Chairman of the Paving Commission, Baltimore, Md.; F. F. Rogers, State Highway Commissioner of Michigan; H. W. Durham, Chief Engineer of Highways, Borough of Manhattan, New York, N. Y., and E. Brian, City Engineer of Windsor, Ont.]

MAJ. CROSBY: Mr. President, I move the acceptance of the report of the Credentials Committee, and that the thanks of the meeting be extended to Chairman Jackson for the very excellent and comprehensive report which he has read.

MR. MEEKER: I second the motion.

PRESIDENT McLEAN: Is there any discussion, gentlemen? You have heard the motion; those in favor, please say aye; opposed, no. The motion is carried.

The next item of business is the recommendation to the Association of the Board of Directors, adopted in accordance with the constitution, proposing an amendment to the by-laws.

SECRETARY POWERS: This resolution was passed by the Board of Directors at a meeting held February 27, 1914. The secretary's records are as follows:

"Moved by W. W. Crosby, seconded and carried, that the dues of the Association be raised to four dollars, beginning with the year 1915, and that each member should be supplied at the expense of the Association with a subscription to 'Good Roads.' It was also moved by Mr. Crosby, seconded and carried that the Executive Committee be instructed to take up with the publishers the matter of supplying 'Good Roads' to members of the Association, and report at the next meeting."

[After a brief discussion participated in by Major Crosby, Treasurer of the Association; President McLean, Secretary Powers and others, the amendment was adopted.]

PRESIDENT McLEAN: In connection with the letter from Mr. Jeffreys, Secretary of the British Road Board, would it not be well if the President or Secretary were authorized to reply on behalf of the Association?

MAJ. CROSBY: I make that motion, Mr. President.

MR. MEEKER: I second that motion.

PRESIDENT McLEAN: It is moved and seconded that the Secretary be authorized to acknowledge the greetings of the Secretary of the British Road Board in a fitting manner. All in favor say aye; opposed, no. The motion is carried.

That, I think, concludes the business of the session, unless there is something else.

MAJ. CROSBY: Speaking for "the good of the order," as I remember that it has come up in the course of the meetings of the various organizations I have belonged to from time to time, I would like to suggest, if I may be permitted, that one way we can help the Association is to increase the membership. I have been trying to do something along that line myself. I know the Secretary has worked very hard in communicating with people to get them into the Association, and I merely at this time would like to ask that those present who show by their attendance here at this late hour their interest in the Association, help us if they can in getting members into the Association.

PRESIDENT McLEAN: Is there anything further? Otherwise, I will declare closed the most successful convention in the history of the American Road Builders' Association. The meeting is adjourned.

Annual Dinner of the A. R. B. A.

The annual dinner of the American Road Builders' Association was held at the Hotel La Salle, Chicago, Ill., on Wednesday evening, December 16, 1914, the third day of the eleventh annual convention. Over three hundred members and guests attended.

During the dinner a musical program was rendered by a male quartet, which also led the diners in the singing of popular songs. Comparatively few after-dinner speeches were made, most of the time being taken up by a vaudeville entertainment furnished by professional entertainers comprising several singers and dancers and a "magician."

Before the vaudeville brief speeches were made by President W. A. McLean, who acted as toastmaster; Hon. W. H. Armstrong, Minister of Public Works of the Province of Nova Scotia, Canada, and Wm. G. Edens, President of the Associated Roads Organizations of Chicago and Cook County. At the close of the vaudeville entertainment an address was made by State Highway Commissioner John N. Carlisle, of New York, and Eben More, of Eben More & Co., Consulting Engineers, Airdrie, Scotland.

The menu follows:

COTUIT OYSTERS

PETITE MARMITE WITH PARMESAN
Celery Olives Radishes.
FILET OF BASS, LA SALLE
Potatoes Parisienne
SUPREME OF GUINEA-HEN WITH VIRGINIA HAM
Grilled Sweet Potatoes Asparagus Tips
GRAPE FRUIT AND ORANGE SALAD
ICE CREAM FANTASIE
Assorted Cakes
CHEESE
Toasted Crackers
DEMI-TASSE
Cigars Cigarettes

Short Course in Highway Engineering at the University of Michigan

As has been noted previously in these pages, the Department of Engineering at the University of Michigan, at Ann Arbor, will conduct a short course in highway engineering during next month. The course, which is for the benefit of highway commissioners, highway engineers and others interested in the construction and maintenance of roads and pavements, will be given during the week commencing Monday, February 15.

The work, according to the announcement of the University, will consist of a thorough discussion of Michigan road conditions and materials, and it is announced that it will be entirely free from the influence of commercialism. The staff of instruction will be composed of the members of the faculty of engineering of the University of Michigan, members of the Michigan State Highway Department and a number of outside lecturers, among the latter being T. H. MacDonald, State Highway Engineer of Iowa; Charles M. Strahan, Dean of Engineering, University of Georgia; Prevost Hubbard, Chief of the Division of Roads and Pavements, Institute of Industrial Research; Ira O. Baker, Professor of Civil Engineering, University of Illinois; O. L. Grover, Chief Bridge Engineer, U. S. Office of Public Roads, and W. W. Crosby, Consulting Highway Engineer, Baltimore, Md. There are to be no laboratory fees or charges of any kind in connection with the course.

Information regarding the course may be obtained from Henry E. Riggs, Professor of Civil Engineering, University of Michigan, Ann Arbor.

Short Course in Highway Engineering at the University of Illinois

A short course in highway engineering will be given under the direction of the Civil Engineering Department of the College of Engineering, University of Illinois, Urbana, Ill., January 11-22, 1915.

The purpose of the course, as set forth in the announcement regarding it appearing in the "University of Illinois Bulletin" of recent date, is "to aid county superintendents of highways and township highway commissioners in the discharge of their official duties and also to disseminate information concerning the construction and maintenance of wagon roads and bridges." The course will consist principally of lectures, laboratory demonstrations and discussions. The lectures will be given in the engineering lecture room, room 221, Engineering Building.

The laboratory demonstrations will be given in various laboratories as follows: Tests of cement, brick and macadam in the cement laboratory of the Department of Civil Engineering; tests of gravel in the lecture room of the mechanical engineering laboratory; demonstrations of the mixing and curing of concrete in the concrete laboratory of the Department of Theoretical and Applied Mechanics; tests of steel and concrete in the materials testing laboratory of the Department of Theoretical and Applied Mechanics; tests of bituminous road materials in room 101 of the Chemistry Building. The demonstrations of tests of cement, brick and macadam will be made by E. L. Bowling, Assistant in charge of the Cement Laboratory; the tests of gravel by C. Older, Bridge Engineer of the Illinois State Highway Commission, and the tests of bituminous road materials will be demonstrated under the direction of F. L. Roman, Testing Engineer of the Illinois Highway Commission. In connection with the course there will be an exhibition of drawings showing the standard plans for roads and bridges of the State Highway Departments of Illinois, Iowa, Kansas and Wisconsin; photographs; samples of material, etc.

The staff of instruction includes members of the faculty and corps of instructors of the University of Illinois; members of the State Highway Departments of Illinois, Iowa, Wisconsin and Kansas, and other highway engineers and chemists.

The course is open to all who wish to attend, there being no charges of any kind by the University nor any requirements except that of registration.

Paving Recommended for 1915 in Salt Lake City, Utah, consists principally of the improvement of streets to connect those in which pavements have already been laid, and City Engineer Cannon has recommended that the improvements to be made be decided upon early enough to permit the awarding of contracts not later than next May. Among the streets on which paving is recommended are 3d, 9th, 11th, 12th, 13th, North State, Second North, Center, North Temple and B Sts.

The Sixth Good Roads Show

The Sixth Good Roads Show was held in conjunction with the Eleventh Annual Convention of the American Road Builders' Association at Chicago, Ill., December 14-18, 1914.

Like the five preceding expositions of machinery, materials and methods employed in the construction and maintenance of roads, which have been held under the auspices of the A.R.B.A., the exhibition included a large number of exhibits comprising a great variety of machinery and materials used in highway work. There were 119 exhibitors, 108 of which were commercial, the remainder being non-commercial. The commercial exhibits included construction equipment ranging from small hand tools to large, heavy machines; models of contractors' equipment; engineering and testing instruments; photographs, maps and diagrams; samples of material used in construction and maintenance such as stone, gravel, cement, asphalts and tars; sections of patented pavements and pavements built with patented materials, and exhibits illustrating the various methods employed in construction and maintenance of roads and the testing of road materials. The non-commercial exhibits included those of six states, three cities, the Province of Ontario and the Office of Public Roads of the United States Department of Agriculture. In addition to these exhibits, there was a model boulevard, 20 ft. wide and nearly 500 ft. long, consisting of short sections of pavement each built of a different material or by a different method.

The exhibition was held in the International Amphitheater at South Halsted and 43d Sts. The exhibits of machinery were accommodated in the South Pavilion, the exhibits of material in the North Pavilion and the model boulevard and the educational exhibits in the arena occupying the center of the building between the two pavilions. As at previous exhibitions, a uniform scheme of decorations and signs was followed in the arrangement of the booths, and through the initiative of individual exhibitors many of the booths were very handsomely furnished and decorated.

The names of the exhibitors and their representatives, together with brief descriptions of their exhibits, are given in the following paragraphs:

The Acme Road Machinery Co., Frankfort, N. Y., exhibited photographs of rock crushing machinery, pulverizers, tanks, graders and other machinery included in its line, and distributed catalogues. The company was represented by David B. Cook, Vice President and Secretary, and L. G. Jennings, District Manager.

J. D. Adams & Co., Indianapolis, Ind., exhibited a model of a road grader. The company was represented by Ethan Kendall.

The Albrecht Excavator Co., Milwaukee, Wis., exhibited an Albrecht excavator and loader. The representatives of the company were John H. Albrecht, President; Raymond F. Ethier, Secretary; Walter B. Louer, Chicago Representative, and J. J. McManamy.

"The American City," New York, N. Y., distributed copies of the publication. It was represented by James H. Van Buren, Advertising Manager, and J. T. Dix, Chicago Representative.

The American Clay Machinery Co., Bucyrus, Ohio, exhibited a ⅞-yd. American revolving steam shovel. The representatives of the company were H. S. Simpson, Assistant to the President; H. B. Crum, Mechanical Engineer, and C. Burnett, Erecting Engineer.

The Amies Road Co., Easton, Pa., exhibited samples of Amiesite pavement and photographs of Amiesite pavements. The representatives of the company were F. W. Schmidt, Vice President; I. W. Wortman, Secretary, North Jersey Amiesite Co.; W. T. Newcomb, Engineer; J. L. Stackhouse, Assistant Secretary and Treasurer; William Halton, General Manager, Amiesite Department, Chas. T. Eastburn Co., Mt. Vernon, N. Y.; M. T. Coakley, Chief Chemist; R. L. Matchett, New York State Sales Agent, and H. B. Allen, Philadelphia Sales Agent.

The Arrow Motor Cartage Co., Chicago, Ill., exhibited and demonstrated a Lee loader. The company's representatives were A. P. Lee, Proprietor; Morse C. Lee, Superintendent; H. A. Lee, H. A. Worcester and J. Madigan, Salesmen, and Chas. Greenleaf, Porter.

The Association of American Portland Cement Manufacturers, Philadelphia, Pa., distributed literature at its booth, and was represented by W. A. MacIntyre, Chief Road Engineer, and W. H. Gardiner, Division Engineer.

The Austin-Western Road Machinery Co., Chicago, Ill., exhibited a 7-ton tandem roller. The company's representatives were T. K. Abbott, General Sales Agent, and L. Worrell, Roller Demonstrator.

The Ayer & Lord Tie & Timber Co., Chicago, Ill., occupied a booth jointly with the Chicago Creosote Co., the Kettle River Quarries Co. and the U. S. Wood Preserving Co., and exhibited wood paving blocks in the arena boulevard.

John Baker, Jr., Chicago, Ill., exhibited samples of asphalts, road oils and pavement fillers; a barrel of Texaco asphalt and a barrel of California asphalt, and a statue made of asphalt. The company was represented by Mr. Baker and by W. H. Kershaw, Manager, New York office; M. E. McDonough, Manager, Philadelphia office; D. A. Kennedy, Manager, Boston office; J. J. Gartland, Manager, Buffalo office; P. S. Coyne, Manager, Minneapolis office; C. H. Draney, Manager, Denver office; J. D. Forrester, Manager, Kansas City (Mo.) office; George W. Hunt, Sales Manager, Chicago office, and W. E. Tyer, Jas. T. Ware, H. E. Lersch, D. H. Hogan, T. A. Hickey and Frank Brace, Salesmen.

The Baldwin Locomotive Works, Philadelphia, Pa., exhibited photographs of steam and gasoline industrial locomotives. The company was represented by A. S. Goble.

The Barber Asphalt Paving Co., Philadelphia, Pa., exhibited samples of asphalts, photographs and moving pictures of Trinidad and Bermudez asphalt lakes and the production and use of these asphalts in road construction. The company's representatives were D. T. Pierce, Executive Assistant; Charles W. Bayliss, Manager Street and Road Department; H. M. Stafford, Assistant Manager, Street and Road Department; L. R. Lewis, R. G. McKay, Milford Smith, W. P. Blackwood, F. F. Massey, E. R. Gibson, Henry Monning, W. F. Moore, J. B. Klunk and J. E. Morris, Salesmen, and R. J. Cummins.

The Barber Asphalt Paving Co. (Iroquois Works), Buffalo, N. Y., exhibited a 5-ton Iroquois tandem steam roller and small paving tools. The representatives were H. J. Kearney, Manager; F. A. Browne, Superintendent; T. H. Morris, Western Representative, and C. A. Schnabel, Salesman.

The Barrett Mfg. Co., New York, N. Y., exhibited samples of Tarvia "A," "B" and "X;" a model of Tarvia filled road; transparencies showing the construction of a Tarvia road; an automobile truck for applying Tarvia, and a pressure tank wagon for applying Tarvia. The company was represented by P. P. Sharples, Manager, General Tarvia Department; F. S. Hutchinson, Manager, New York Tarvia Department; B. M. Smith, Manager, Chicago Tarvia Department; R. W. Pond, Manager, Boston Tarvia Department; Fred Jones

Manager, Cincinnati Tarvia Department; D. T. Perry and Edward C. Sargent, Managers, Cleveland Tarvia Department; A. B. Cowdery, General Tarvia Department; C. M. Cottam, St. Louis Sales Manager; W. G. Bickell, Fairfield (Ala.) Sales Manager; W. J. Walker, Kansas City Manager; S. Roe Robinson, Minneapolis Manager; S. M. Cowan, New York Salesman; George B. Chadwick, District Manager, Paterson Mfg. Co., Toronto, Ont., and B. E. Smith, Paving Department, Paterson Mfg. Co., Toronto, Ont.

The Bausch & Lomb Optical Co., Chicago, Ill., exhibited engineering instruments and optical goods, including transits, tachymeters, dumpy levels, Y levels, plane tables, alidades and binocular field glasses. The representatives were C. A. Bengston, Chicago Manager, and B. H. Witherspoon.

"Better Road and Streets," Jamestown, Ohio, distributed sample copies of the publication. The representatives of the publication were Jesse Taylor, Editor-in-Chief; Claude Clark, Secretary; J. Horace Lytle, Advertising Manager, and J. V. Ecker, Subscription Representative.

The Bituminized Road Co., Kansas City, Mo., exhibited samples of National pavement and photographs. The representatives were J. Edgar Black, Director, and H. W. Phillips, Secretary.

The Blackmer Rotary Pump Power & Mfg. Co., Petoskey, Mich., exhibited one 100-gal. belt driven pump, two small motor driven pumping outfits, one 50-gal. belt driven pump and a 2-HP. motor for driving the 100-gal. pump. The company was represented by A. B. Klise, President, and J. H. Oldham, Superintendent.

The Bonney Supply Co., Inc., Rochester, N. Y., exhibited one full size "Rapid" loader and a quarter size model of the same machine. The representatives were E. A. Bonney, President, and T. R. Simpson, Secretary and Treasurer.

The Bucyrus Co., South Milwaukee, Wis., exhibited a model 14-B revolving steam shovel in operation, transparencies and photographs of excavating machinery. The company was represented by P. E. Dutcher; F. A. Rumbarger; Forrest Fordham; S. E. Elmore, Central Sales Manager; G. A. Morison, Secretary, and George Williams, Shovel Operator.

The Buffalo Steam Roller Co., Buffalo, N. Y., exhibited a Buffalo Pitts double drive tandem roller. The representatives of the company were D. L. Brandow; J. F. Richardson, Sales Manager, and P. R. Cunningham, Chicago Branch Manager.

Buff & Buff Mfg. Co., Chicago, Ill., exhibited a line of surveying instruments, with tripods, cases, etc., and subway and tunnel instruments of the kind used in New York. The representatives were Madison S. Jordan, Central States Manager, and Harold L. Dunbar and Frank L. Stone, Salesmen.

GENERAL VIEW OF THE ARENA AT THE INTERNATIONAL AMPHITHEATRE DURING THE SIXTH GOOD ROADS SHOW—MODEL BOULEVARD SURROUNDING CENTRAL PARKING

The Burdick Enamel Sign Co., Chicago, Ill., exhibited enamel street signs and signs for similar purposes. The company was represented by E. F. Burdick, Secretary, and H. S. Dean, Salesman.

The Philip Carey Co., Cincinnati, Ohio, exhibited a model showing the Carey elastite expansion joint and samples of the joint. The company was represented by F. C. Bowman, Manager, Expansion Joint Department; F. R. Schueler, Manager, Chicago Branch, and C. L. Cockrell, W. R. Deal, C. W. Bower, R. M. Hallam, J. B. Huntington, A. J. King, C. S. King, F. C. LeRow, L. F. Mansfield, W. F. Moore, R. B. Murdock, J. H. Slingerlend and W. E. Zimmerman, Salesmen.

GENERAL VIEW OF A PART OF THE MACHINERY SECTION AT THE SIXTH GOOD ROADS SHOW AT CHICAGO, ILL., DEC. 14-18, 1914

The J. I. Case Threshing Machine Co., Racine, Wis., exhibited a rock crusher and storage bin, road graders, a road roller, an oil traction engine, a dump wagon and wheel and drag scrapers. The representatives of the company were E. G. Hartle, General Manager, Road Division; H. B. Anderson, Chicago Representative; J. H. Keegan, Chicago Manager, and O. R. Randall.

"The Cement Era," Chicago, Ill., distributed sample copies of the publication. It was represented by H. W. Baumgartner, President; James E. Montgomery, Vice President, and Jos. J. Nemee, Secretary.

The Chain Belt Co., Milwaukee, Wis., displayed a Chain Belt paver, equipped with delivery boom and bucket, and a Rex mixer. The representatives of the company were Roger Van Vechten, Salesman; W. B. Louer, Chicago Representative; C. F. Messinger, Advertising Manager; W. C. Frye, Treasurer, and Sam Shofer, Engineer.

The Chicago Builders' Specialties Co., Chicago, Ill., agent for the Marsh-Capron Mfg. Co., Chicago, Ill., and the Erie Machine Shops, Erie, Pa., exhibited the concrete mixers and the tandem roller listed in the exhibits of those two companies. The representatives were H. M. Capron, President; G. A. Whitehead, Secretary, and A. Rennolds, J. V. Sullivan, Jno. M. Pierce, S. N. McCaleb, A. D. Mosby, W. A. Hoyt, T. R. Gray, W. H. Bennett and Geo. Nowak.

The Chicago Creosote Co., Chicago, Ill., occupied a booth jointly with the Ayer & Lord Tie & Timber Co., the Kettle River Quarries Co. and the U. S. Wood Preserving Co., and exhibited wood paving blocks in the arena boulevard.

The Chicago Portland Cement Co., Chicago, Ill., distributed memorandum book souvenirs and literature. The representatives were F. S. Phipps, W. S. Conn, F. J. Cassidy, C. H. Greenleaf and C. M. Wood.

"The Contractor," Chicago, Ill., distributed copies of the publication and exhibited text books. The publication's representatives were E. H. Baumgartner, Publisher; M. D. Kohler, General Manager; C. P. Stikes; Sam. M. Moore and Leonard Hintze.

The F. D. Cummer & Son Co., Cleveland, Ohio, exhibited photographs of the Cummer one-car road plants, stationary and semi-portable plants, sand and stone driers, heaters, and similar machinery. The company was represented by I. Preeman.

The Eugene Dietzgen Co., Chicago, Ill., exhibited a large line of surveying and engineering instruments and drawing materials. The company's representatives were W. E. Cook, Secretary; W. O. Phillips, Assistant Manager; W. H. Lerch, Assistant Treasurer, and C. S. Breckenridge and L. F. Parr, Salesmen.

The Domestic Engine & Pump Co., Shippensburg, Pa., exhibited a combination diaphragm and centrifugal pumping engine and a portable high pressure gasoline direct connected pumping engine. The company was represented by C. B. Segner, General Superintendent.

The Dunn Wire-Cut-Lug Brick Co., Conneaut, Ohio, displayed samples of brick from the 23 licensees manufacturing Dunn wire-cut-lug brick, slabs of brick pavement, special paving blocks and photographs of roads and streets paved with wire-cut-lug brick. The company's representatives were F. B. Dunn, General Manager; W. T. Blackburn, Consulting Engineer; W. C. Perkins, Chief Engineer, Inspection Department; F. T. Townsend and E. B. Schmidt, Assistant Engineers; F. A. Churchill, Manager, Press Service, and Miss B. E. Kinner, Secretary.

"Engineering News," New York, N. Y., distributed sample copies of the publication. The representatives were E. E. R. Tratman, Western Editor; B. D. Butler, J. P. Newman and Allen Brett, Advertising Representatives, and P Harris, Circulation Department.

"Engineering Record," New York, N. Y., distributed sample copies of the publication. It was represented by W. W. De Berard, Western Editor; R. H. Hunter, Assistant Editor; Fred W. Schultz, Wm. Van Kleeck and L. Gardiner, Advertising Representatives.

"Engineering and Contracting," Chicago, Ill., distributed sample copies of the publication. The representatives were

C. R. Thomas, Editor, and W. H. Fogarty, F. G. Hudson and A. L. Marsh.

The Eagle Wagon Works, Auburn, N. Y., exhibited a bottom dump wagon and a model of a two-wheeled trailer. The representatives of the company were C. C. Avery, Secretary and Sales Manager, and J. R. Everson, Salesman.

The Erie Machine Shops, Erie, Pa., exhibited a 5-ton tandem steam roller. The company was represented by P. W. Dietly and the company's Chicago agent—the Chicago Builders' Specialties Co.

The A. B. Farquhar Co., Ltd., York, Pa., exhibited photographs of Farquhar tractors and road engines. The company was represented by R. B. Morris.

The Frohman Chemical Co., Sandusky, Ohio, exhibited with the Rocmac Road Corporation of America, Ltd. The representatives of the company were Sidney Frohman, Walter T. Haines and Howard M. Ambruster.

The Galion Iron Works & Mfg. Co., Galion, Ohio, exhibited models of the line of road machinery manufactured by it, including graders, a stone unloader, a Universal road finisher; full size samples of corrugated and cast iron pipe, and transparencies showing machinery, pipe, etc. The company's representatives were D. C. Boyd, President; C. H. Rawlins, General Sales Manager; F. J. Babcock, Indiana Sales Manager; H. Hohnholz, Iowa Sales Manager; J. P. McHale, Michigan Sales Manager; D. B. Holly, Minnesota Sales Agent, and W. N. Wright, Wisconsin Sales Manager.

"Good Roads," New York, N. Y., distributed copies of the publication. It was represented by E. L. Powers, President and Editor; H. L. Powell, Advertising Manager; T. A. Hulbert, Associate Editor, and L. A. Kennicott, Chicago Representative.

The Headley Good Roads Co., Philadelphia, Pa., exhibited a bituminous road planer and samples of Bicomac pavement, Bicomac and H. G. R. No. 1. The company's representatives were W. T. Headley, President; Jas. P. Hennessy, New England Representative, and E. J. Hunt, New York Representative.

"The Highway Contractor," Albany, N. Y., distributed sample copies of the publication. It was represented by M. G. Rosenthal.

The Huasteca Petroleum Co., New Orleans, La., exhibited samples of crude and refined "Ebano" asphalts and asphalt testing apparatus. The representatives of the company were A. R. Knight, Sales Manager, and F. D. Kessler, Superintendent, New Orleans Plant.

Robert W. Hunt & Co., Engineers, Chicago, Ill., exhibited literature and other matter describing and illustrating the service rendered by them in inspection. The representatives were H. H. Morgan, W. T. Reeves, J. H. Campbell and C. B. Nolte.

Chas. Hvass & Co., Inc., New York, N. Y., exhibited a line of machinery for heating and distributing oil, for spreading sand and for cleaning streets, including two automobile distributors, a large heater and a sand spreading wagon. The company was represented by C. T. Hvass.

The Ideal Concrete Machinery Co., Cincinnati, Ohio, exhibited a paving mixer. The representatives were M. Wetzstein, President; N. Ransohoff, General Superintendent; T. W. Barrett, City Salesman, Crerar, Adams & Co., and P. J. Ford, Purchasing Agent, Crerar, Adams & Co.

The Illinois Stone Club, Chicago, Ill., exhibited samples of crushed stone and photographs of quarries and roads. The representatives were O. P. Chamberlain, President; Paul Henderson, Secretary; T. A. Kerr, General Manager; W. L. Hodgkins, Treasurer; Al. Sullivan, Chas. Klotz and A. C. O'Laughlin, Directors, and Stuart Gardiner and W. N. Carter of the National Stone Co.

The Ingersoll-Rand Co., New York, N. Y., exhibited a portable gasoline driven air compressor, a rock drill mounted on a tripod, a "Jackhammer" hand hammer drill and a Crown coal pick hammer. The representatives were C. W. Melcher, General Manager; M. P. Frutchey, Chicago Manager; D. A. Slattery, A. V. Steele, J. P. Gillies, J. H. Pascoe, G. C. Williams, C. E. Planck, O. F. Weiss, W. D. Baiker, H. J. Gaumond and J. R. Raudle.

VIEW IN THE MACHINERY SECTION AT THE SIXTH GOOD ROADS SHOW AT CHICAGO, ILL., DEC. 14-18, 1914

The International Motor Co., Chicago, Ill., exhibited a 7½-ton Mack power dump truck and photographs. The company's representatives were Messrs. Hodges, Griffin, Curran, Leiser, Barrowman, Dickson, Cottier and Roche.

The Jaeger Machine Co., Columbus, Ohio, exhibited two concrete mixers. The representatives of the company were E. B. Kelley, E. R. Bacon, S. M. Coe, S. H. Edlin, Fred N. Wilson, A. E. Davis, G. Jaeger, W. B. Simpler and A. S. Millikin.

The Thomas B. Jeffery Co., Kenosha, Wis., exhibited a four-wheel drive dumping truck, together with working parts of the truck. Those representing the company were J. K. Bond, A. M. Robbins and Henry Farrington of the Truck Department.

The Jennison-Wright Co., Toledo, Ohio, exhibited samples of Kreolite lug block, Kreolite-Hex block, Kreolite nose filler block for T-rails, creosoted piling, Kreolite tongue and groove bridge planking and a sample of a Kreolite bridge floor. The company's representatives were H. G. Jennison, President; F. W. Cherrington, Chief Engineer; F. B. Goodman, Canadian Representative; F. E. Jennison and F. M. Enright, Chicago Representatives, and L. P. Drinker, Eastern Representative.

The Kinney Mfg. Co., Boston, Mass., exhibited a Kinney oiler and flusher mounted on a motor truck chassis. The representatives were E. B. Neal, Assistant General Manager; H. K. Potter, Manager, Municipal Department; C. O. Thurston, Manager, Chicago District; W. E. Worcester, Philadelphia District Manager.

The Knox Motors Co., Chicago, Ill., exhibited a Knox tractor with a Watson bottom dump trailer and demonstrated other tractors with a Watson bottom dump trailer and a Bull Dog double dump trailer. The representatives of the company were John R. Bensley, Chicago Manager; Bert E. Fisher and Robert N. Motherwell, Salesmen; C. F. Rouze, Special Representative, and Otto Tragman, Demonstrator.

The Koehring Machine Co., Milwaukee, Wis., exhibited two concrete paving mixers. The company's representatives were Philip Koehring, Secretary and Treasurer; G. E. Hillsman and G. H. Miller, District Sales Managers, and H. W. Taylor, Salesman.

The F. J. Lewis Mfg. Co., Chicago, Ill., exhibited samples of brick pavement with Lewis filler. The representatives of the company were F. J. Lewis, President, and C. C. Bulger.

SIXTH GOOD ROADS SHOW, CHICAGO, ILL., DEC. 14-18, 1914—VIEW THROUGH CENTER AISLE OF THE MATERIALS SECTION.

The Kelly-Springfield Motor Truck Co., Springfield, Ohio, exhibited a 5-ton Kelly-Springfield chassis equipped with a 1,000-gal. Kinney oiler and flusher; a 5-ton Kelly-Springfield chassis, equipped with a steel dumping body; a 3½-ton Kelly-Springfield chassis, stripped; a 1-ton Kelly-Springfield chassis, stripped, and an assortment of parts of the chasses. The company's representatives were H. H. Robinson, Manager; C. W. Thompson, Sales Manager; Roy M. Hutchinson, Salesman; E. A. Schroeder, Cashier, and Charles Morrison.

The Kettle River Quarries Co., Minneapolis, Minn., occupied a booth jointly with the Ayer & Lord Tie & Timber Co., the Chicago Creosote Co. and the U. S. Wood Preserving Co., and exhibited wood paving blocks in the arena boulevard.

Keuffel & Esser Co., Hoboken, N. J., exhibited a line of engineering and surveying instruments and drawing materials. The representatives were W. A. Hildreth, Western Salesman; Jas. Carlisle, Michigan Representative, and Harry Huster, Chicago Salesman.

The Marion Steam Shovel Co., Marion, Ohio, exhibited photographs of steam shovels used in road work. The representatives were R. H. Rossiter, Manager, Chicago office, and Roy Jacoby, Salesman.

The Marquette Cement Mfg. Co., of Chicago, Ill., exhibited samples of Portland cement and raw material and photographs of concrete road construction. The company was represented by Gold Williams, Sales Manager, and John G. Evans, Salesman.

The Marsh-Capron Mfg. Co., Chicago, Ill., exhibited a Marsh-Capron paving mixer and a small grout machine. The company's representatives were G. A. Whitehead, Sales Manager, and J. M. Pierce and Jos. Sullivan.

The Martin International Trap Rock Co., Bruce Mines, Ont., exhibited samples of trap rock for road work. The company was represented by G. B. Martin, General Manager.

The Mechling Bros. Mfg. Co., Camden, N. J., exhibited with the Rocmac Road Corporation of America, Ltd. The representatives were B. F. Mechling and C. S. Sumervell.

VIEW THROUGH WEST AISLE OF THE MATERIALS SECTION AT THE SIXTH GOOD ROADS SHOW UNDER THE AUSPICES OF THE A. R. B. A.

N. S. Monroe & Sons, Arthur, Ill., exhibited a Jumbo road leveler and a Monroe road drag. The company was represented by N. S. Monroe, Proprietor, and C. D. Robinson, Salesman.

The Municipal Engineering & Contracting Co., Chicago, Ill., exhibited a street paving mixer. The company's representatives were Wm. Storms, Salesman; James McElroy, Assistant Shop Engineer, and Chas. C. Post, Erecting Engineer.

The "Municipal Journal," New York, N. Y., distributed sample copies of the publication. The company was represented by S. W. Hume, President, and C. A. Dickens, Western Manager.

The National Paving Brick Manufacturers' Association, Cleveland, Ohio, exhibited paving bricks made by various manufacturers, and photographs. It was represented by Chas. J. Deckman, President; Will P. Blair, Secretary, and H. H. Macdonald, Assistant Secretary.

The Novo Engine Co., Lansing, Mich., exhibited five engines and pumps. The company was represented by Geo. G. Tucker, Chicago Manager.

The Orenstein-Arthur Koppel Co., Chicago, Ill., exhibited a portion of the Koppel road hauling outfit, consisting of a track and cars, and displayed photographs illustrating the outfit in operation. The company was represented by Louis Hellmann, Manager, Chicago Branch; O. T. Christerson, Salesman, Chicago Branch, and E. J. Shellaby, Salesman, Pittsburgh Branch.

Orr & Sembower, Inc., Reading, Pa., exhibited a Class "E" vertical boiler, a class "F" vertical engine, a No. 100 belt hoist, a No. 132 hoisting engine, a 6-HP. vertical gasoline engine, a 6-HP. horizontal gasoline engine and an

VIEW THROUGH EAST AISLE IN THE MATERIALS SECTION AT THE SIXTH GOOD ROADS SHOW AT CHICAGO, ILL.

8-HP. gasoline hoisting engine. The company was represented by G. K. Sembower, Secretary, and Irving W. Kinney, Chicago Representative.

The Philadelphia Quartz Co., Philadelphia, Pa., exhibited with the Rocmac Road Corporation of America, Ltd. The representatives of the company were J. P. Elkinton; M. T. Calef, Road Engineer, and Brooks E. Miller.

The Power & Mining Machinery Co., Cudahy, Wis., exhibited a No. 14 street paver, a No. 00 International Globe type mixer, a No. 00 International low feed mixer, an International trench pump, equipped with engines and mounted on trucks, and a 6-HP. Ingeco gasoline engine. The company was represented by John D. Bird, General Manager; Robert Stavenau, Mechanical Engineer; T. O. Browning, Chicago Representative, and W. J. Rosebery, Jr., Sales Manager, Concrete Mixer Department.

The Rapid Mixer Co., Grand Rapids, Mich., exhibited a Rapid Heated mixer. The company was represented by Edward W. Seamans, General Manager; Wallace E. Crowell, Manager, Sales Department; Will B. Seamans, Chief of Construction Department, and Roy C. Whayne, Kentucky Representative.

"The Road Maker," Des Moines, Ia., distributed copies of the publication. It was represented by R. M. Graham, Advertising Manager.

The Robeson Process Co., New York, N. Y., exhibited photographs and specimens of roads treated with Glutrin. The company was represented by Geo. N. Moore, Advertising Manager, and Gordon L. Lindsey, H. H. Hurt and W. M. Whitelaw.

T. M. Roche, Chicago, Ill., occupied a booth with C. B. Smith & Co.

The Rocmac Road Corporation of America, Ltd., Philadelphia, Pa., exhibited cartons of Rocmac solution, sample sections of Rocmac roads and photographs of Rocmac roads. The company was represented by Frank H. Keefer, President; M. J. K. Allen, General Manager; A. C. Johnston; John Sears and George Michaud.

The Russell Grader Mfg. Co., Minneapolis, Minn., exhibited printed matter and photographs. It was represented by E. E. Ellertson, President, and John B. Foley, Salesman.

The Semet-Solvay Co., Syracuse, N. Y., displayed a model of a water bound macadam road treated with calcium chloride and also exhibited samples of that material. The representatives of the company were F. S. Lighthall, Western Sales Agent; Geo. P. Spencer, New England Sales Agent; Donald G. Munroe, and W. E. McNasser.

C. B. Smith & Co., Cleveland, Ohio, exhibited a portable asphalt paving plant. The representative of the company was Thomas M. Roche, Chicago Representative.

The T. L. Smith Co., Chicago, Ill., exhibited a No. 509 Smith-Chicago concrete street paver, a Smith "Mascot" concrete mixer and a Smith Mixerette. The company's representatives were H. C. Beckwith, Chicago District Manager; Harold E. Smith and Payne G. West, Factory Representatives, and Otto Matzek, Expert Demonstrator.

The Standard Asphalt & Rubber Co., Chicago, Ill., exhibited samples of asphalt, asphaltic flux, asphalt road oil, asphalt filler, and photographs and cross sections of asphaltic roads. The company was represented by G. L. Schomburg, Advertising Manager; W. H. Bell, Manager, Paving Department; J. F. McGuirk and G. S. Woodford, Chicago Salesmen; R. E. Kartack, Baraboo (Wis.) Salesman; E. D. Sherrick, Kansas City (Mo.) Representative; C. V. Eades and R. F. Trumbull.

The Standard Oil Co. (an Indiana corporation), Chicago, Ill., exhibited samples of road oils and binders and photographs of roads built or treated with those materials. The representatives of the company were W. H. Leonard, Manager, Road Oil Department; F. T. Allen, Assistant Manager; W. H. Myers, F. J. Radcliffe, H. E. Crain, C. W. Brand and W. L. Belt, Salesmen.

The Standard Scale & Supply Co., Chicago, Ill., displayed a concrete mixer for road work. The company was represented by L. P. Boyles and Joseph Simpson, Salesmen.

The Steel Protected Concrete Co., Philadelphia, Pa., exhibited a model of Wainwright curb bar in the arena. The company was represented by John J. Donlen, Jr.

A. Streich & Bro. Co., Oshkosh, Wis., exhibited a dump wagon. The representatives of the company were F. A. Streich, Secretary; W. T. Daum, Manager, Chicago Branch, and Wm. Shuter, Assistant Manager, Chicago Branch.

The Tarrant Mfg. Co., Saratoga Springs, N. Y., exhibited road oiling and street cleaning equipment, including "Tarco" can and bag carriers, street sweeping brushes, etc. The company was represented by Wm. R. Wilson, Treasurer.

The Thew Automatic Shovel Co., Lorain, Ohio, exhibited a Thew steam shovel. The representative of the company was D. D. Deeds, Sales Manager.

The Troy Wagon Works Co., Troy, Ohio, exhibited a 2-yd. dump wagon and photographs. The company's representatives were R. C. Sykes, Assistant Manager; Geo. G. Tucker, Manager, Chicago office, and H. K. Hampson, Salesman.

The Trussed Concrete Steel Co., Youngstown, Ohio, exhibited Kahn armor plates for expansion joints; Kahn curb bars; rib metal, "Trus-Con" side forms; "Hy-Rib," and general concrete reinforcing steel. The company was represented by S. M. Fecheimer, Publicity Manager; G. H. Russey; H. J. Stambaugh, Secretary, Canadian Co.; C. H. Gayen, District Manager, Chicago; John Bowditch, Jr., Manager, Highway Department.

The Turbine Sewer Machine Renovating Co., Milwaukee, Wis., exhibited sewer cleaning apparatus. The representatives of the company were Philip A. Fuchs, President, and F. H. Fuchs, Vice President.

The United States Asphalt Refining Co., New York, N. Y., exhibited samples of asphalts and road oils, photographs, pamphlets, etc. The representatives of the company were O. E. Thurber, Vice President; Geo. W. S. Whitney, Secretary; J. R. Draney, General Sales Manager; James R. Valk, Western Sales Manager; Geo. R. McGrath, Southern Sales Manager; Leroy M. Law, Chief Chemist, and E. J. Dewine, Columbus Sales Agent.

The U. S. Wood Preserving Co., New York, N. Y., occupied a booth jointly with the Ayer & Lord Tie & Timber Co., the Chicago Creosote Co. and the Kettle River Quarries Co., and exhibited wood paving blocks in the arena boulevard.

The Universal Portland Cement Co., Chicago, Ill., exhibited a model showing concrete road construction; sections of concrete pavement removed from roads of Bellefontaine, Ohio; Sioux City, Iowa, and Wayne County, Mich.; charts and diagrams showing the practice in the construction of concrete roads; maps showing the distribution and location of concrete roads, and photographs of concrete roads. The following representatives were present: From the Sales Department—B. F. Affleck, General Sales Agent; Blaine S. Smith, Assistant General Sales Agent; R. F. Hall, F. L. Stone, C. C. Secrist, C. D. Clugston, A. C. Wilby, T. S. Pabst and J. D. Scovel, Assistant Sales Agents; R. W. Wallace, Henry Royer, E. W. Watson, L. A. Bissonette, C. F. Ott, F. L. Jaeger, J. W. Shaw, G. A. Hanke, H. C. McCabe, L. E. DeGarmo, E. E. Mick, J. C. Larimer, C. J. Hoffman, B. S. Keyes, E. J. Dowdall, B. A. Thrift, H. B. Kirk, T. N. Hunt, W. H. Kremer, J. P. Jerka, R. I. Bathurst, O. A. Strass, A. E. Robinson and H. W. Snell. From the Publicity Bureau—J. P. Beck, Manager, and S. E. Bates, M. A. Berns, H. A. Craig, E. S. Hanson, L. F. Mead, H. W. Robbins, E. A. Sutcliffe and P. D. Van Vliet. From the Inspecting and Information Bureau—Wm. M. Kinney, Chief Inspecting Engineer; K. H. Talbot, Assistant Inspecting Engineer, and C. K. Arp, J. H. Libberton, C. M. Powell, E. A. Dolan, C. D. Franks, P. W. King, G. H. Reiter, J. H. Anderson, W. S. Anderson, L. S. Packman, M. C. Tobias and L. J. N. Keliher.

The Utility Road and Farm Machinery Co., Chicago, Ill., exhibited a traction grader and trenching machine. The company was represented by R. T. Hanrahan, President; J. H. Clark, Vice President and General Manager; T. P. Hanrahan and E. J. Curtis, Salesmen, and W. P. Hanrahan, Assistant Salesman.

The Warner-Quinlan Asphalt Co., New York, N. Y., exhibited samples of Montezuma asphalt and photographs showing roads and streets in which that product was used. The representatives were Wm. D. Baker, Sales Manager, and John H. Portenheimer.

The Warren Brothers Co., Boston, Mass., exhibited samples of Bitulithic, Bitustone and Endurite pavements and Warrenite roads; a machine for cutting samples from pavements, and photographs. The representatives of the company were P. S. Kaull and Geo. M. Ingram, Vice Presidents; F. G. Cutter, Assistant to President and General Agent; Earle W. Pimm, Manager, Publicity Department; Guy G. Budge, Chicago Representative; Fred B. Davis, E. M. Robinson, J. M. Woodruff and Messrs. McKendrick, Hough and Archibold.

The Watson Wagon Co., Canastota, N. Y., exhibited a Watson dumping wagon. The company was represented by W. B. Pantall, Sales Manager, and J. D. Harrison, Western Representative.

The Wheeling Corrugating Co., Chicago, Ill., exhibited 10-ft. lengths of Corco channel nestable culverts and Crescent riveted corrugated culverts. The company was represented by A. W. Crotsly, Manager; W. M. Sawyer and E. R. Clark, Assistant Managers, and John H. Diehl.

The Wiard Plow Co., Batavia, N. Y., exhibited a contractor's plow and photographs. The company was represented by Arthur G. Hough, President and Treasurer, and Louis Wiard, Superintendent.

The Wisconsin Granite Co., Chicago, Ill., exhibited samples of granite blocks and crushed granite. The company was represented by F. A. Sloan.

M. P. Zindorf, Seattle, Wash., exhibited a model of a road planer, grader and ditcher. Mr. Zindorf was in attendance.

Besides the exhibits listed in the foregoing, practically all of the exhibitors distributed literature. In addition, many of them gave useful and, in many cases, valuable souvenirs. Most of the machines in the machinery section were shown in operation.

The educational exhibits, which consisted of maps, photographs, charts, diagrams, plans and similar displays, were made by the highway departments of six states—Arizona, Illinois, Massachusetts, Michigan, New York and Wisconsin; three cities—New York, Chicago and Philadelphia; the Province of Ontario, Canada, and the Office of Public Roads of the United States Department of Agriculture. These exhibits were made in booths along the sides of the arena, the space between them and the pavements in the model boulevard being occupied by a graveled sidewalk.

The largest of the city exhibits was made by the City of Chicago, which occupied the entire space across the building at the west end of the arena. Immediately in front of the booth was a roadway on which was illustrated the practice followed by the city in resurfacing old roads. This included the application of an asphaltic concrete wearing surface over old macadam, construction of asphaltic wearing surface over old brick paving and the construction of asphaltic surfacing over old granite block. Another portion of this exhibit showed the utilization of waste asphalt.

The pavement sections in the boulevard comprised samples of practically every type of country road or city pavement in common use, including many of the patented or so-called proprietary pavements. This boulevard—a new departure in exhibits—was one of the most striking and noteworthy features of the show. The exhibits in the boulevards were as follows:

Standard Asphalt & Rubber Co., Chicago, Ill., Sarco cold surfacing for concrete pavements, Sarco expansion joints for concrete paving and Sarco filler for brick paving.

The Standard Oil Co., macadam with Standard Oil binder and brick paving with Standard Oil filler.

The Ayer & Lord Tie Co., Chicago, Ill., creosoted wood block paving.

Wisconsin Granite Co., Chicago, Ill., granite block paving.

Jennison-Wright Co., Toledo, Ohio, Kreolite paving and Kreolite lug block paving.

Dunn Wire-Cut-Lug Brick Co., Conneaut, Ohio, brick pavements.

Association of American Portland Cement Manufacturers, concrete pavements.

Warren Brothers Co., Boston, Mass., Bitustone and Warrenite pavements.

Barrett Mfg. Co., New York, N. Y., Tarvia macadam.

Barber Asphalt Paving Co., Philadelphia, Pa., Trinidad asphaltic concrete and Bermudez asphaltic macadam pavements.

F. J. Lewis Mfg. Co., Chicago, Ill., Taroid macadam.

United States Asphalt Refining Co., New York, N. Y., Aztec asphaltic concrete.

Steel Protected Concrete Co., Philadelphia, Pa., Wainwright curb bar in a concrete curb at the side of the roadway.

NEWS NOTES

The 1915 Street Improvement Program of Canton, O., calls for the construction of about 14 miles of paving. The carrying out of this work, according to a recent statement by Service Director Kent, depends upon whether the engineering force is enlarged and sufficient appropriations made. It is stated that if the proposed work is done, 1915 will probably be a record year for street work in the city, which at present has nearly 50 miles of paved roadway.

At a Recent Meeting of the Bexar County Highway League at San Antonio, Tex., the following officers and directors were elected: President, William Cassin; First Vice President, J. L. Strohm; Second Vice President, Edward Rand; Treasurer, J. M. Vance; Secretary, D. E. Colp. Directors: M. J. Arnold, D. E. Colp, A. M. Fischer, Charles Graebner, J. L. Lytle, Tom Applewhite, A. B. Stephens, J. L. Strohm, J. W. Warren, George C. Saur, William Dobrowolski, W. H. Furlong, Jr., Charles E. Scoff, H. L. Miller, T. N. Smith, H. P. Street, J. M. Vance, William Cassin, Edward Rand, R. O. Whiteaker, Lee Ransom, T. B. Baker, S. C. Kyle, E. R. Gofford and M. C. Judson. According to a report made by Secretary Colp, the total amount of bonds voted in the entire state during the past year was $6,400,000.

The Purchase of a Considerable Amount of Road Machinery for Work in 1915 is proposed by the highway authorities of Polk County, Ia. It is reported that the purchases will include two large traction engines and at least four graders, in addition to dump wagons, horses, cooking tents and other equipment. The purchases will be made by the county authorities during the winter so that work may be commenced as soon as possible in the spring. According to the present plans, two traction outfits will be employed, one in the southern or western portion of the county and the other on the opposite side of the county. It is said that the use of heavy machinery has not been possible heretofore on account of the number of wooden bridges not sufficiently strong to carry the weight of such equipment. During the last three years, however, most of these bridges have been replaced by concrete structures so that the machinery can now be moved from one part of the county to another, as desired.

The American Association of State Highway Officials

An organization known as the American Association of State Highway Officials was organized at the Hotel Raleigh, Washington, D. C., on December 12, 1914.

The purposes of the organization, as set forth in the constitution, are to "study the various materials, methods of construction and maintenance and other highway problems of the United States, to exchange ideas, to promote a closer relationship between state highway departments with a view of establishing uniform system of administration, construction and maintenance and legislation for the purpose of conserving the capital invested in highway construction and maintenance by producing the highest possible efficiency, and to cooperate in every way possible with the United States Office of Public Roads or similar federal organization in the consideration of road problems."

Three classes of membership—active, associate and honorary—are provided for in the constitution. Active members are to be "state highway commissioners and chief engineers or other chief directing officials actively engaged in the administrative work of the various highway departments of the different states and of the U. S. Government;" associate members are to be "such assistant and deputy commissioners, assistant and resident engineers and chief directing officials in the highway departments of other North American countries and their provinces as are not chief directing officials actively engaged in the administrative work of the state highway department," and honorary members are to be "ex-state highway officials and the professors of highway engineering in accredited universities." It is provided that voting upon all questions shall be by states, each state department and the federal department being entitled to one vote. The dues for active membership are $5.00 per year and for associate membership $3.00 per year.

It is stated that the state highway commissioners and engineers of all the states were invited to be present at the Washington meeting. The state highway officials and others who were present were as follows: Wm. D. Sohier, Chairman, Massachusetts Highway Commission; S. Percy Hooker, State Superintendent of Highways of New Hampshire; Paul D. Sargent, Chief Engineer of the Maine State Highway Commission; George A. Ricker, Deputy State Highway Commissioner of New York; Col. E. A. Stevens, State Highway Commissioner of New Jersey; Henry G. Shirley, Chief Engineer, State Roads Commission of Maryland; George P. Coleman, State Highway Commissioner of Virginia; A. D. Williams, Chief Road Engineer of West Virginia; Robert C. Terrell, State Commissioner of Roads of Kentucky; James R. Marker, State Highway Commissioner of Ohio; Lamar Cobb, State Engineer of Arizona; Joseph Hyde Pratt, State Geologist and Engineer of North Carolina; Sidney Suggs, State Highway Commissioner of Oklahoma; F. M. Kerr, Chief State Engineer of Louisiana; W. S. Keller, State Highway Engineer of Alabama; James H. MacDonald, former State Highway Commissioner of Connecticut; T. Warren Allen, former State Highway Commissioner of New York; Logan Waller Page, Director, U. S. Office of Public Roads; P. St. J. Wilson, Assistant Director, U. S. Office of Public Roads; J. E. Pennybacker, Chief, Road Economics, U. S. Office of Public Roads.

Officers for the coming year were elected as follows: President, H. G. Shirley, Chief Engineer of the Maryland State Roads Commission; Vice President, A. B. Fletcher, State Highway Engineer of California; Secretary, Dr. Joseph Hyde Pratt, State Geologist and Engineer of North Carolina; Treasurer, Frank F. Rogers, State Highway Commissioner of Michigan; Executive Committee: George P. Coleman, State Highway Commissioner of Virginia, Chairman; Wm. D. Sohier, Chairman of the Massachusetts Highway Commission; James R. Marker, State Highway Commissioner of Ohio; Col. E. A. Stevens, State Commissioner of Public Roads of New Jersey, and Lamar Cobb, State Engineer of Arizona.

After the completion of the organization of the association, the matter of federal aid was discussed and several resolutions were passed and referred to the Executive Committee. At 2 o'clock on the afternoon of the day of the meeting the commissioners and engineers were received by President Wilson at the Executive Office at the White House.

Course in Highway Engineering at the University of Kentucky

As has been previously announced in these columns, a short course in highway engineering will be given at the University of Kentucky, Lexington, Ky., January 4-15, 1915.

The course will be given under the direction of the Highway Engineering Department of the College of Civil Engineering and will be given free, the only entrance requirement being registration. The mornings will be devoted to lectures by experts on various subjects and the afternoons to practical work in the field and office. The field work will consists of the use of the compass, level, transit and other engineering instruments, three to five men being placed under the instruction of one senior engineer. After the completion of this field work the men will go into the drafting room and plot the notes.

The laboratory of the department will be open afternoons and those bringing samples of material will be given an opportunity to test them. It is also expected that there will be an exhibition of road building machinery.

The Work of the Pennsylvania Bureau of Township Highways

In a recent bulletin of the Pennsylvania State Highway Department, the purpose of the Bureau of Township Highways and its work are reviewed at some length.

The Bureau was created by an act of the Pennsylvania Assembly, commonly known as the "Supervisors' Law" because it prescribes the method of election and the duties of township supervisors. The act was approved July 22, 1913, and became effective on Dec. 1, 1913. The functions of the bureau, as noted in previous issues of "Good Roads" are, speaking broadly, to have general supervision over township highways and to cooperate with the township highway officials for the purpose of improving methods of carrying on road work and making such methods more nearly uniform throughout the state.

In accordance with those provisions of the law providing for the holding of meetings and the formation of county associations of township supervisors, meetings have been held in practically every county in the state, a representative of the Bureau being present at each one. The total attendance at the meetings held between Dec. 1, 1913, and April 16, 1914, is given in the report as 3,268.

An important part of the work of the Bureau is the furnishing of plans and specifications for the construction of bridges and culverts, and for other work. Between Dec. 1, 1913, and Oct. 1, 1914, 236 bridge plans were furnished to township authorities. During the same period 47 applications were received for road surveys, plans and specifications, and 4 plans for pavements were submitted for the approval of the Bureau.

Another duty of the Bureau is the approval of contracts for the purchase by the township of road materials, tools and machinery in excess of $100. The orders and contracts of this kind approved by the Bureau from Jan. 1 to Oct. 1 of the present year amounted to $341,072.70.

AMERICAN ROAD BUILDERS' ASSOCIATION

150 NASSAU STREET
NEW YORK, N. Y.

President
W. A. McLEAN, Toronto, Ont.

First Vice President
GEO. W. TILLSON, Brooklyn, N. Y.

Second Vice President
A. W. DEAN, Boston, Mass.

Third Vice President
A. B. FLETCHER, Sacramento, Cal.

Secretary
E. L. POWERS, New York, N. Y.

Treasurer
W. W. CROSBY, Baltimore, Md.

Through the courtesy of the publisher of "Good Roads," this page, each month, is devoted to the use of the American Road Builders' Association. It is solely in the interests of the Association, and it is the desire of the Executive Committee that all members feel that this space is their own, and that they contribute freely to it, not only as regards anything concerning the Association itself, but also that which will further the good roads movement. Besides the official announcements of the Association, there will appear on the page contributions by members, items of news concerning the Association activities and personal notes about its members. All contributions should be sent to the headquarters of the Association at 150 Nassau Street, New York, N. Y.

Executive Committee:
Geo. W. Tillson
R. A. Meeker
E. L. Powers

The Convention Proceedings

An account of the Eleventh Annual Convention of the Association, held at Chicago, Ill., December 14 to 18, appears in this issue of "Good Roads." This includes practically all of the proceedings and several of the papers and discussions. In the issue of February 6 more of the papers will be printed. The official proceedings are now being prepared for the printer and will be issued at an early date.

According to present plans, the proceedings will contain—as last year—the stenographic report of the convention; a list of the exhibitors; a report of the annual meeting in February, including the reports of the Secretary and Treasurer; the constitution and by-laws; a list of officers for 1914 and that for 1915; a list of the standing committees of the organization, and a list of the members.

The proceedings will be furnished free to members of the A. R. B. A., as heretofore, and will be sold to non-members at $2.00 per copy.

A.R.B.A. Members at the Meeting of the A.A.A.S.

The program for the meeting of Section D, Engineering, of the American Association for the Advancement of Science at the University of Pennsylvania, Philadelphia, Pa., Dec. 30 and 31, included a number of A. R. B. A. officers and members. Their names, together with the titles of their papers, follow:

Wm. H. Connell, Chief, Bureau of Highways and Street Cleaning, Philadelphia, Pa., "Municipal Highways—A Problem in Maintenance;" Logan Waller Page, Director of the U. S. Office of Public Roads, Washington, D. C., "Methods for the Elimination of Politics from Adminstration of Highway Departments;" Major W. W. Crosby, Consulting Engineer, Baltimore, Md., "Specifications Covering the Rolling of Road Crusts of Various Types;" Joseph H. Conzelman, Graduate Student in Highway Engineering, Columbia University, New York, N. Y., "Financial Problems Involved in the Selection of a Suitable Type of Road or Pavement;" Charles Henry Davis, President, National Highways Association, Cambridge, Mass., "Preliminary Surveys and Mapping of National Highways;" A. D. Williams, Chief State Road Engineer of West Virginia, Morgantown, W. Va., "Construction of Highways with Convict Labor in West Virginia;" H. W. Durham, Chief Engineer, Bureau of Highways, Borough of Manhattan, New York, N. Y., "Service Tests on Various Classes of Pavements;" H. H. Schmidt, Chief Engineer, Bureau of Highways, Borough of Brooklyn, New York, N. Y., "Service Tests of Stone Block Pavements in Brooklyn;" George W. Tillson, Consulting Engineer to the President of the Borough of Brooklyn, New York, N. Y., "The Value of the Absorption Test on Wood Blocks;" W. H. Lustin, Jr., Civil Engineer and Surveyor, Elizabeth, N. J., "Cement Concrete Pavements with Thin Bituminous Surfaces;" Philip P. Sharples, Chief Chemist, Barrett Mfg. Co., New York, N. Y., "Topeka Bituminous Concrete Pavements Constructed with Tar Cement;" Arthur H. Blanchard, Professor of Highway Engineering, Columbia University, New York, N. Y., "Bituminous Pavements with Two or More Layers of Bituminous Concrete," and "A Review of the Use of Bituminous Materials in Highway Engineering during 1914;" Frederick Steele Strong, Division Engineer, New York State Highway Department, Hornell, N. Y., "Bituminous Macadam Pavements (Penetration Method);" H. B. Pullar, Engineering Chemist, Detroit, Mich., "Allowable Maximum Penetration of Various Types of Asphalts for Use in the Several Kinds of Bituminous Pavements."

New Members

During the past month about 150 names have been added to the membership roll of the Association.

These additions, together with those which have been noted from month to month on this page, make a very large increase in the Association's membership since the last issue of the official proceedings.

The number who joined the A. R. B. A. during the convention and at other times since the last Road Builders' page appeared, is so large that it is impracticable to print their names on this page. They will all appear, however, in the official proceedings, which, as noted elsewhere on this page, will be issued in the near future.

A. R. B. A. Notes

The annual meeting of the Association will be held at the Hotel Astor, New York, N. Y., on the afternoon of Friday, February 5.

Major W. W. Crosby, Consulting Engineer, Baltimore, Md., for several years Treasurer of the A. R. B. A., will have charge of the course in highway engineering in the Extramural Division, New York University. This and the other courses in the division are offered by the University for those in the engineering service of the City of New York.

A more extended announcement regarding these courses will be printed in a later issue of "Good Roads."

State Highway Commissioner Charles J. Bennett, of Connecticut, is recovering from a several weeks' illness with typhoid fever.

Among the non-resident lecturers who have recently addressed the graduate students in highway engineering at Columbia University are the following A. R. B. A. members: A. W. Dean, Chief Engineer of the Massachusetts Highway Commission; S. R. Church, Manager of the Research Department of the Barrett Mfg. Co., New York, N. Y., and George W. Tillson, Consulting Engineer to the President of the Borough of Brooklyn, New York, N. Y. Mr. Dean lectured on Dec. 3 on "Specifications for Sizes and Physical Properties of Broken Stone;" Mr. Church on Dec. 7 on the subject "The Essential Physical and Chemical Properties of Creosote Oils for Wood Blocks," and Mr. Tillson on Dec. 11 on "European Wood Block Pavements."

PERSONAL NOTES

George A. Warner has resigned as City Engineer of York, Pa.

O. H. Lange has been elected City Engineer of Quitman, Ga.

M. N. Garrett has resigned as City Engineer of Gadsden, Ala.

Woodson Hopkins has been elected City Engineer of Henderson, Ky.

W. A. Jordan, Street Commissioner of Punxsutawney, Pa., has resigned.

H. R. Carter has been reappointed State Highway Engineer of Arkansas.

Chester W. Cummings has been elected Street Commissioner of Lancaster, Pa.

George C. Walters, President of the "Concrete Age," of Atlanta, Ga., died on Dec. 19.

J. W. Williams has been appointed Road Engineer of Nicholas County, Kentucky.

George H. Clark has been elected County Highway Engineer of Jefferson County, Alabama.

R. E. Richardson, City Engineer of Longmont, Colo., has been elected an associate member of the American Society of Civil Engineers.

Capt. J. W. Brady has resigned as Street Commissioner of El Paso, Tex. He will be succeeded by Michael Mulcahy, Assistant Commissioner.

Henry Strohmeier has been appointed Highway Commissioner of Fort Russell Township, Illinois, succeeding Charles Knoche, resigned.

James Riddle, Superintendent of Road Construction of Tampa, Fla., has resigned. His place will be filled by County Engineer George Fuchs.

W. C. Campbell, Superintendent of Public Works and City Engineer of Columbus, Ga., has been elected an associate member of the American Society of Civil Engineers.

Stephen E. Wilson, who designed the municipal garbage reduction plant of the city of Dayton, Ohio, has been retained to supervise its construction and manage its operation.

G. P. Blackiston has resigned as Advertising Manager of the Berger Mfg. Co. and the Stark Rolling Mill Co., Canton, Ohio, and in future will devote his entire time to the Advertising Laboratories of Canton, Ohio.

As a temporary measure, Sir George S. Gibb, Chairman of the British Road Board, has been appointed an additional civilian member of the Army Council. In that position he will be charged with the supervision of army contracts.

Joseph E. Putnam, Assistant City Engineer of Rochester, N. Y., died in that city on Dec. 10 after an operation. Mr. Putnam, who was 54 years old, had been Assistant City Engineer of Rochester since 1902 and had been especially active in lighting and paving work.

A. W. Dow, of Dow & Smith, Chemical and Consulting Paving Engineers, of New York, N. Y., delivered an illustrated lecture on "Details of Construction of American Wood Block Pavements" before the graduate students in highway engineering at Columbia University on Dec. 7.

William Barclay Parsons, Consulting Engineer, New York, N. Y., and Daniel L. Turner, Deputy Engineer of Subway Construction, Public Service Commission, New York, N. Y., have been appointed members of the Advisory Commission on City Planning of the Board of Estimate and Apportionment of New York City.

W. W. Marr, M. Am. Soc. C. E., Consulting Engineer of the Sheridan Road Improvement Association of Chicago, Ill., has been appointed Chief State Highway Engineer of Illinois to succeed A. N. Johnson, M. Am. Soc. C. E., who resigned on July 1 and is now a member of the staff of the Bureau of Municipal Research of New York City.

James H. MacDonald, formerly State Highway Commissioner of Connecticut, has opened an office for practice as a consulting engineer in the Chamber of Commerce Bldg., New Haven, Conn. Mr. MacDonald, who was State Highway Commissioner of Connecticut for nearly eighteen years, has had wide experience in highway work and will devote his entire time to private practice as a consulting road and paving expert.

LETTER TO THE EDITOR

Applying a Bituminous Coating to Concrete

Editor "Good Roads":

I think it would be of interest to you to know of an experiment which has just been conducted in Worcester on a contract with the Hassam Paving Co. The work is new in this locality, and so far as I can ascertain, seems to be new in general.

There is always great difficulty in applying a bituminous blanket coat on a cement macadam or Hassam pavement, there being great difficulty in getting a proper bond. Work in the past has usually been done after the surface has set, necessitating some material of a sticky nature, elastic and pliable under traffic. This, in the course of a short time, of course, if it is a bituminous product, becomes brittle through the evaporation of the various oils in the materials, causing brittleness, and under the impact of hoofs and wheels, breaking and shaling off from the concrete base beneath.

In this new method of application, the bond, it seems to me, could not be made much more perfect. On a 5-in. Hassam paving base a layer of a mixture of emulsified asphalt, sand and peastone was applied, raked off evenly and rolled in by a 6-ton roller, this being applied immediately after the grouting of the stone with the cement grout, before it had any opportunity to set, rolling the two in together and while both were in a plastic and soft state. In this case the emulsified asphalt was that which is known under the trade name of Bi-co-mac. This method of procedure united both the top and bottom layers in a very thorough manner, and within a few days the material was hard and fit for travel. On top of the blanket coat was applied a paint coat of the same material, covered with a coating of coarse sand. I do not know of any case or method by which a better bond for a blanket coat on cement macadam has been obtained.

ALBERT T. RHODES,
Worcester, Mass. Street Commissioner.

COMING MEETINGS

January 20-21, 1915.—American Wood Preservers' Association.—Convention, Chicago, Ill. Secretary, F. J. Angier, Mt. Royal Station, B. & O. R.R., Baltimore, Md.

February 9-12, 1915.—American Concrete Institute.—Convention at Chicago, Ill. Secretary, E. E. Krauss, Harrison Bldg., Philadelphia, Pa.

February 10-17, 1915.—Cement Products Exhibition Company.—Eighth Chicago Cement Show, Coliseum, Chicago, Ill. General Manager, J. P. Beck, 208 South La Salle St., Chicago, Ill.

NEWS OF THE TRADE

Pugh & Hubbard, Civil and Sanitary Engineers, of Philadelphia, Pa., have been retained by the Commissioners of Middletown, Del., to prepare plans and specifications for the paving of the streets of that city. This work is to be done after the construction of a sewerage system and sewerage disposal plant, the plans for which are now being drawn by the same engineers.

The "National Pavement" is the title of an attractive 12-page circular recently gotten out by the Bituminized Road Co., of Kansas City, Mo. The circular is devoted to a description of the "National" pavement and its construction and to laboratory reports and testimonials relating to the pavement. The illustrations consist of views of the pavement completed and under construction. The circular is printed in brown and green on cream-colored paper and is 8 by 9½ ins. in size.

The United States Circuit Court of Appeals (Second Circuit) has recently handed down a decision affirming the validity of the Watson corrugated culvert patent No. 559,642. The question of the validity of this patent has been before the courts for a number of years, with the apparent advantage first on one side and then on the other, and has been of much interest. It is stated that the present decision is final and that circumstances are such that no appeal can be taken. The patent is for a corrugated metal culvert composed of connected cylindrical sections, each of which terminates at one end in a flared portion of the corrugation and the other in a contracted portion of the corrugation, so that the sections may interlock, the ends being held in place by bolts or similar means. The manufacturers of corrugated culverts under this patent make them of Armco American Ingot Iron.

The Birdsboro Stone Co., of Philadelphia, Pa., is distributing a handy diary and memorandum book containing, besides the usual information printed in the back and front of such books, a table of quantities of stone for various widths of road, brief specifications for water bound and surface treated macadam and tables of quantities and tests of Birdsboro products.

The Standard Scale & Supply Co., of Chicago, Ill., manufacturer of the Standard concrete mixer, report a record of 275 lin. ft. of 16-ft. concrete road laid in an 8-hour day with that machine and a force of 13 men consisting of 11 laborers, an engineer and foreman. The work was done by the Jerry McCarthy Co., of Boston, Mass., on a contract for the construction of about 12,000 sq. yds. of granite block paving with cement grout joints laid on a concrete base on Massachusetts Ave., Boston, Mass.

The Buffalo Steam Roller Co., Buffalo, N. Y., has recently issued several new trade publications. One is a large 16-page catalogue describing and illustrating Buffalo Pitts rollers; another is a smaller catalogue of 32 pages describing Buffalo Pitts tandem rollers; a third is a small booklet, containing 32 pages, entitled "A Suggestion to Contractors," which describes and illustrates the construction and operation of the company's tractors and rollers, and another is a small folder calling attention to the Buffalo Pitts special park and cemetery roller.

The Studebaker Corporation, South Bend, Ind., has recently issued a number of new catalogues and other trade publications, including a large catalogue of Studebaker dump wagons; a 4-page circular describing the Studebaker uniform pressure power street flusher; a similar circular devoted to the Studebaker road oiler; two small catalogues, one of 8 pages and the other of 16 pages, describing, respectively, the Studebaker removable sleeve bar axle wagons and Studebaker street sprinklers and sweepers; an 8-page booklet of directions for the operation and care of the 4-cylinder, 4-cycle engine used on the Studebaker uniform pressure street flusher; two folders, one describing and illustrating Studebaker sprinklers, flushers, sweepers and distributors and the other dumping wagons; and a number of mailing folders describing Studebaker wagons and distributors. All of the matter is attractively gotten up and well illustrated.

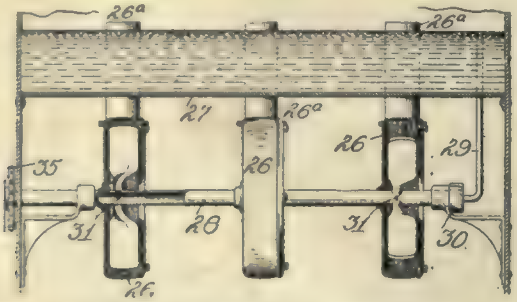
A Double-Leaf, Bascule Bridge Costing $231,940 is to be was awarded to the Penn Bridge Co., of Philadelphia, Pa., at a recent meeting of the Board of Supervisors of Monroe County. It is expected that construction work will be commenced early next spring.

Individual Property Owners of Lodi, Cal., have expended over $107,000 for street and sidewalk work in that city during the past two years, acording to reports. The work done has comprised the paving of several streets and alleys, having a total length, with the addition of work for which contracts have recently been let, of over two miles and the construction of over two miles of sidewalk. Of the total cost, approximately $100,000 was expended for paving and something over $7,500 for sidewalks.

A Total of $526,000 was Expended for Road Construction in New Mexico During 1914, according to a recent report from the office of State Engineer James A. French. It is also reported that during 1915 $520,000 will be expended, exclusive of an issue of $500,000 of state bonds which have not yet been sold. It is reported further that the annual report of State Engineer French will show the Camino Road practically completed from the Colorado line to El Paso. Among the improvement projects which will be taken up during 1915 are the Santa Fe-Taos Road, the Los Lunas-Gallup Road, the Ocean-to-Ocean Highway from Socorro to the Arizona line, the All Southern Route and a portion of the Borderland Route.

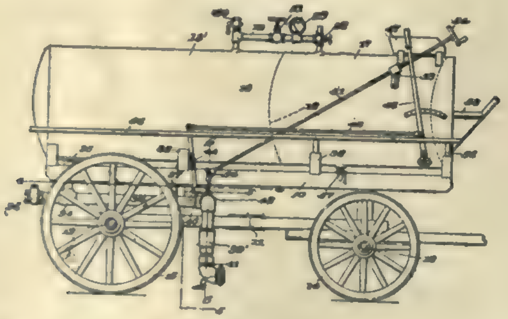
RECENT PATENTS

The following list contains the numbers of the principal patents relating to roads and pavements and to machinery used in their construction or maintenance which have recently been issued, together with the names and addresses of the patentees, dates of filing, serial numbers, etc. In some cases the principal drawing has also been reproduced. Printed copies of patents listed may be obtained for 5 cents each by application to the Commissioner of Patents, Patent Office, Washington, D. C.

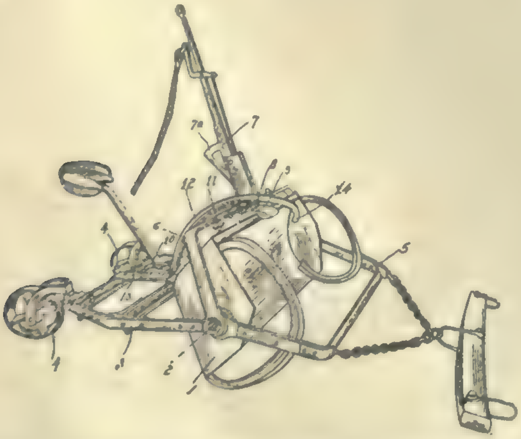


1,120,068. STREET SWEEPING APPARATUS. John C. Lundy, Brantford, Ont., Canada. Filed Jan. 13, 1914. Serial No. 811,862. (Cl. 83-47.)

1,120,104. REINFORCED CONCRETE BRIDGE CONSTRUCTION. William M. Thomas, Los Angeles, Cal. Filed Nov. 13, 1911. Serial No. 660,151. Renewed Apr. 22, 1914. Serial No. 833,803. (Cl. 72-56.)



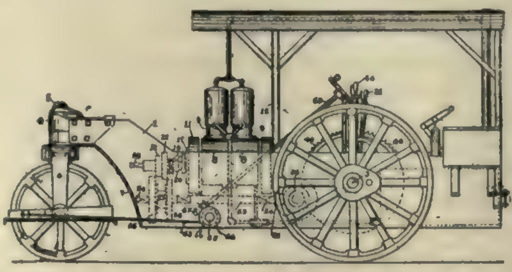
1,120,177. STREET SPRINKLER. Orrie A. Yonker, Shenandoah, Ia. Filed July 8, 1913. Serial No. 777,852. (Cl. 137-63.)



1,120,261. SCRAPER. Charles Child and Alexander H. Keir, Wallace, Cal. Filed May 21, 1914. Serial No. 840,026. (Cl. 37-33.)

1,120,316. STONE WASHER AND DRIER. William Lange, Tomkins Cove, N. Y., assignor of one-half to Calvin Tomkins, New York, N. Y. Filed Jan. 15, 1914. Serial No. 812,304. (Cl. 83-86.)

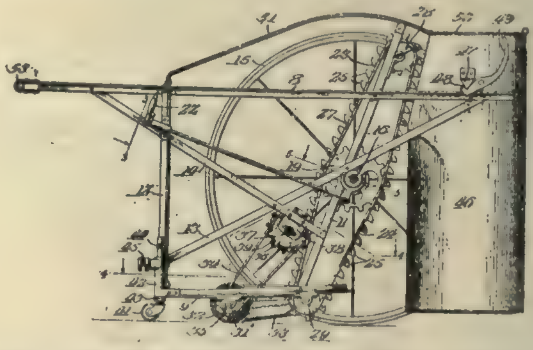
1,120,358. VEHICLE DUMP. Christopher L. Aygarn, Seneca, Ill. Filed Sept. 24, 1913. Serial No. 791,455. (Cl. 214-11.)



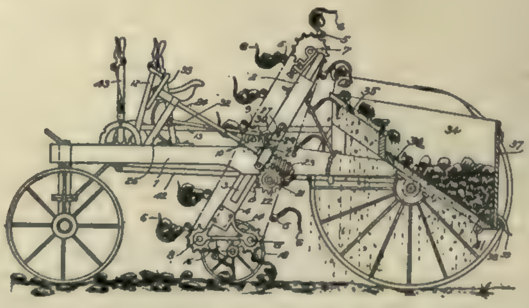
1,120,427. ROAD ROLLER. Lawrence B. Webster, Marion, Ind. Filed Feb. 18, 1910. Serial No. 544,644. (Cl. 21-114.)

1,120,471. CULVERT. William Henry Franklin, Red Lodge, Mont. Filed Apr. 23, 1914. Serial No. 833,967. (Cl. 72-52.)

1,120,706. SEWER AQUEDUCT, OR LIKE CONDUIT. William C. Flannery, Washington, D. C. Filed Sept. 3, 1913. Serial No. 788,016. (Cl. 72-53.)



1,121,059. STREET SWEEPING MACHINE. Arthur A. Andrews, Rockford, Ill., assignor of one-half to Julius G. Weinberg, Rockford, Ill. Filed June 8, 1914. Serial No. 843,745. (Cl. 15-17.)



1,122,101. STONE PICKING MACHINE. Octave Gingras and Joseph Couture, Laurierville, Quebec, Canada. Filed July 25, 1913. Serial No. 781,056. (Cl. 55-17.)

The Commissioners' Court of Dona Ana County, N. M., has sold road bonds amounting to $50,000. The proceeds will be used for road improvements, upon which work will be started in the near future.

The Board of County Commissioners and the County Road Board of Otero County, N. M., have taken up the work of improving the road between Alamogordo and Orange. The commissioners have made a special levy of 5 mills for road purposes, in addition to the regular levy for road maintenance.

GOOD ROADS

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New Series, Vol. IX.

NEW YORK, JANUARY 9, 1915

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Paving Work in St. Paul, Minnesota

According to the present plans, 312 blocks, or about 24 miles, of streets will be paved in St. Paul, Minn., during next season. It is stated that, while no estimate has yet been made of the cost, it will probably amount to $1,250,000. Wood block and asphaltic macadam will be the materials used.

Paving laid in 1914 cost about $1,000,000 and comprised about 16 miles of streets. This work included one very large undertaking—the construction of 125,000 sq. yds. of wood block paving on University Ave., at a cost of $398,600. Creosoted wood blocks were also laid on Summit Ave., at a cost of $274,350; Snelling Ave., at a cost of $52,000; Prior Ave., at a cost of $42,600; Hastings Ave., at a cost of $27,700, and on a number of other streets. On Dale St. two miles of creosoted wood block were laid between Grand Ave. and Front St., and brick between Front St. and the railroad. The city now has over 95 miles of paved streets.

Work of Louisiana State Highway Department

During 1914, according to a recent report, 10 parishes in Louisiana received state aid in the construction of 133 miles of road, of which 65 miles were of gravel. The total cost was about $450,000. In addition to this work, a considerable mileage of roadways provided for under previous contracts were completed during the year at a cost of over $300,000.

State Highway Engineer W. E. Atkinson called attention in a recent statement to the importance of maintenance. He said that the department had endeavored to have state aid highways maintained by the police juries of the various parishes, but that it had not been successful in this respect. Experience has shown, according to Mr. Atkinson, that the local authorities, except in rare cases, can not be depended upon to maintain state aid roads after construction. He said that the department, by reason of its inability to contribute its share toward the maintenance of state aid highways, had been forced to postpone action in the past until such time as it should be in position to secure the necessary funds for the purpose. The maintenance of the state aid highways after construction is so necessary, according to Mr. Atkinson, that the Highway Department has decided to set aside out of the revenues of 1915 a sufficient fund for maintenance, and aid in this work will be extended to the parishes in the same manner as in construction work.

Road Work in Rock County, Wisconsin, During 1914

According to the report of County Highway Commissioner C. E. Moore of Rock County, Wisconsin, for 1914, about 45 miles of county and state aid roads were built in the county during the 1914 season.

The total cost of construction and maintenance work on roads and bridges during the year is given as $116,500. The roads built were in 56 different pieces and were practically all of water bound macadam or of gravel. About 18 miles of water bound macadam were built and about 26 miles of gravel. In addition, a large amount of concrete culvert and bridge work was done. In addition to the expenditure for construction and maintenance, about $9,000 was expended for the purchase and upkeep of machinery.

Rock County is one of the few in the state where road work is performed by contract, most of the others doing the work under the day labor plan.

Course in Bituminous Materials, Bituminous Surfaces and Bituminous Pavements at Columbia University

Announcement has been made of a course in bituminous materials, bituminous surfaces and bituminous pavements at Columbia University, New York, N. Y., from January 26 to March 16. This course, which is one of the regular courses in the graduate course in highway engineering at Columbia, is to be given evenings in order to accommodate engineers, chemists, contractors, salesmen and others who are unable to give the necessary time during the day.

The course will be given by Arthur H. Blanchard, Professor in charge of the Graduate Course in Highway Engineering at Columbia; Henry B. Drowne, Instructor in Highway Engineering; Prevost Hubbard, Lecturer in Highway Engineering, and F. P. Smith, Non-Resident Lecturer in Highway Engineering. The course will be given in 15 periods of 2½ hours each, on Tuesday and Thursday evenings, beginning Jan. 26. The lectures will be given in Room 402, Engineering Building, beginning at 7:30 p. m.

The course will be considered as the equivalent of the graduate course in "Highway Engineering 103," it is stated, for those desiring to receive the degree of A. M. with highway engineering as a major. The fee for the course is $20 and the registration fee $5.

Illustrated Lectures on Highway Engineering at Columbia University

Announcement has been made of the following illustrated lectures to be given by non-resident lecturers in the highway engineering course at Columbia University during the remainder of January and in February:

Monday, Jan. 11.—"Preliminary Investigations in Highway Engineer—Value and Methods Employed," Major W. W. Crosby, Chief Engineer, Maryland Geological and Economic Survey, and Consulting Engineer, Baltimore, Md.

Monday, Jan. 18.—"Special Features in Street Cleaning Work—Snow Removal and Annual Municipal Clean-Up Week," William H. Connell, Chief, Bureau of Highways and Street Cleaning, Philadelphia, Pa.

Friday, Feb. 5.—"Methods of Cost Keeping for Highway Engineers and Contractors," Arthur N. Johnson, Highway Engineer, Bureau of Municipal Research, New York, N. Y.

Friday, Feb. 12.—"Public Recognition of and Specifications for Patented Pavements," George C. Warren, President, Warren Brothers Co., Boston, Mass.

Friday, Feb. 26.—"Relation of Tests of Physical Properties and the Wearing Qualities of Paving Materials," Henry W. Durham, Chief Engineer of Highways, Borough of Manhattan, New York, N. Y.

Each lecture is scheduled for 8:30 p. m.

The New York University Course in Highway Engineering

As was noted briefly in the issue of January 2, the New York University, of New York, N. Y., has recently established a course in highway engineering under the supervision of Major W. W. Crosby, C. E., a well-known consulting highway engineer of Baltimore, Md.

This course is one of several in engineering and allied subjects which are offered by the Extramural Division of the University to those in the engineering service of the City of New York. They include, besides advanced courses in highway engineering and other engineering subjects, fundamental courses in English, mathematics, mechanics and design. The courses are all under the direction and control of the University and, in addition, each is under the supervision of a consulting committee. These consulting committees are composed of members of the Advisory Committee of Municipal Engineers. The Consulting Committee for the course in highway engineering consists of George W. Tillson, Consulting Engineer to the President of the Borough of Brooklyn, New York, N. Y., and Rudolph P. Miller, formerly Superintendent of Buildings and now Expert in charge of the Drafting of the Building Code for the City of New York.

The work, which commenced on Monday, Jan. 4, is carried on in evening classes, meeting at 7.45 on Monday, Tuesday, Wednesday, Thursday and Friday of each week. The course in highway engineering, which is given on Friday evenings embraces the following topics: Introduction and history; preliminary consideration; traffic censuses and factors; surveying and plotting; design and selection of surfacings; road and street intersections; drainage and foundations; crowns; earth, gravel and broken stone roadways; bituminous materials and methods of use; cement concrete roadways; pavement economics; curbs, gutters and artificial foundations for pavements; asphalt, brick, stone block and wood block pavements; track-ways in pavements; aesthetic considerations; sidewalks and planting spaces; organization and administration; specifications and tests for road and street materials; street cleaning, dust prevention and snow removal. The text books used are Tillson's "Street Pavements and Paving Materials"; Richardson's "Modern Asphalt Pavements"; Blanchard and Drowne's "Text-Book on Highway Engineering," and Hubbard's "Dust Preventives and Road Binders."

In addition to the regular instruction there are to be special lectures from time to time. The lecturers so far announced for the highway engineering course are Nelson P. Lewis, Chief Engineer of the Board of Estimate and Apportionment of New York, N. Y.; Clifford Richardson, Consulting Engineer, New York, N. Y., and George W. Tillson, Consulting Engineer to the President of the Borough of Brooklyn, New York, N. Y.

The courses are open only to persons in the service of the City of New York or of the Public Service Commission for the First District of New York. The fee for the course in highway engineering is $20, payable in four installments of $5 each.

NEWS NOTES

The Issuance of Road Bonds to the Amount of $200,000 will be voted upon in Greenup County, Kentucky, on the 19th of this month.

Paving Work in Pomona, Cal., which will cost about $150,000, has recently been commenced. Nearly 10 miles of pavements will be laid.

Bonds of Sutter County, California, amounting to $110,000, have recently been sold. The proceeds of the bonds will be used for road work.

The Levy Court of New Catle County, Delaware, has disposed of a bridge bond issue of $150,000 to Harris, Forbes & Co., of New York, N. Y. The bonds were sold at par.

The Total Expenditure by the Pennsylvania State Highway Department during the first eleven months of 1914 amounted to $3,790,916, according to a recent statement by the Auditor-General. It is also stated that the total expenditure for the past two years amounts to $7,756,769.10.

A Contract for Paving on Sloat Boulevard, San Francisco, Cal., has recently been awarded by the Board of Works of that city. The work consists of the construction of nearly 350,000 sq. yds. of asphalt paving on a 30-ft. strip over the entire length of the boulevard. The contract was awarded to Blanchard & Brown at 16.9 cts. per sq. ft.

Over $200,000 is to be Expended in the Annex, Baltimore, Md., for the construction of smooth pavements during 1915. According to reports, over 50 streets are to be paved, the work being done under the direction of the Commissioners for Opening Streets. The necessary funds will be taken from the Annex loan, from which $500,000 is appropriated annually.

At the Recent Convention of the Louisiana Good Roads Association at Alexandria, La., B. M. Miller, of New Orleans, was elected President. A vice president was elected from each of the eight congressional districts, while the selection of a secretary and treasurer was left to the Board of Directors. Lieut. Governor Barrett was among the speakers at the convention.

COMING MEETINGS

January 15.—American Society of Engineering Contractors.—Annual Meeting and Banquet, New York, N. Y. Secretary, J. R. Wemlinger, 11 Broadway, New York, N. Y.

January 20-21.—American Wood Preservers' Association.—Convention, Chicago, Ill. Secretary, F. J. Angier, Mt. Royal Station, B. & O. R. R., Baltimore, Md.

February 9-12.—American Concrete Institute.—Convention at Chicago, Ill. Secretary, E. E. Krauss, Harrison Bldg., Philadelphia, Pa.

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Proposed Reorganization of the New York State Highway Commission

In his first message to the Legislature of New York, Governor Whitman recommended the reorganization of the State Highway Commission by the substitution of a commission of three for the present single-headed commission. Governor Whitman stated that while as a general principle of government and of business he believed in the undivided responsibility of a single head, there were reasons that led him to believe that the New York State Highway Department could best be administered by a non-partisan commission of three members with overlapping terms.

In explanation of this attitude, he called attention to the fact that the state is spending large sums of money for highway work which requires the employment of a large number of men, which has perhaps naturally caused the department to be regarded as a greater political asset to the party in power than are all the other departments combined. He asserted that the machinery of the department has been used very largely for partisan purposes, and stated his belief in the importance of the non-partisan feature of the proposed commission.

Tracing the history of highway improvement in the state, he said that it started under the supervision of the State Engineer and Surveyor, that it did not progress satisfactorily and that under the administration of Governor Hughes there was established a non-partisan commission of three members, one of whom was required to be an engineer and not more than two of whom could be selected from any one party. The work done by this commission, according to Governor Whitman, was largely pioneer work, and during the two years of its existence a trained body of engineers was developed. He said that this work having passed through the experimental stage it seemed that the time had been reached when that commission was prepared to do some effective work, but that with the change of administration the desire to control the department for partisan purposes resulted in a change in the organization to further that end. The scandal connected with the work thereafter led to another change in the law, by which a single-headed commission was created, which, according to Governor Whitman, continued the partisan complexion of the preceding commission with its attendant evils.

Road building, according to Governor Whitman, is the largest and most difficult enterprise ever undertaken by the state, and "hardly a great business enterprise in the country could have survived the ruinous extravagance, incompetency and waste which have characterized the administration of this department for four years last past." He expressed the belief that men can be found who will conduct the affairs of the department in a thoroughly business-like manner, and stated that in his opinion the commission should be so constituted that every incoming administration would have the opportunity to place upon it a representative without changing the entire personnel of the department.

In conclusion, he recommended the creation of a commission of three, appointed by the Governor with the consent of the Senate, the full terms of the commissioners to be six years each and the terms of the three first appointed to be two, four and six years, respectively. He also recommended that one of the three members be an engineer and that no more than two of them be members of any one political party.

Within the past week a bill embodying Governor Whitman's recommendations has been introduced in the Legislature.

Plans for State Road Work in Washington

The total expenditure for state road work in Washington during 1915 and 1916 will be about $2,000,000 if the Legislature continues the levy at the present rates.

It is stated that the work planned for the next biennium consists of the continuation of the work commenced during the past two years, with especial attention to the Pacific, Olympic and Inland Empire Highways. A particular effort, it is stated, will be made to improve the sections in need of improvement on the Pacific Highway, spending between $300,000 and $400,000 south of Tacoma and $200,000 or more north of Tacoma. It is stated that comparatively little mountain work will be undertaken during the coming biennium as compared with that done in 1913-14. Expenditures, however, are to be recommended on the Sunset Highway at both ends of the Snoqualmie Pass section in order to connect with the existing road systems on both sides of the Cascade Mountains. It is probable, also, that work will be recommended on the Olympic Highway, which was built between Hoodsport and Duckabush during the past two years. It is expected that during 1915 and 1916 the road will be extended from Duckabush to Quilcene and from Hoodsport to Shelton.

Paving Plans in Savannah, Georgia

A large amount of paving work is planned for 1915 in Savannah, Ga., the amount appropriated for that purpose being twice that appropriated for similar work last year.

The 1915 appropriation recently made by the City Council amounts to $50,000. This represents one-third of the total amount to be expended, as the property owners pay two-thirds of the cost. In addition to the appropriation of $50,000 for paving, the 1915 budget also carries an appropriation of $35,000 for opening streets and an appropriation of $1,000 for placing street signs.

Street Work in Schenectady, New York

According to the report of City Engineer William B. Landreth, of Schenectady, N. Y., submitted last month, the work completed up to that time and to be completed by February 1 amounts to about $1,500,000.

On Jan. 1, 1914, according to the report, the city had under construction pavements on 30 streets at a cost of $230,000 and a large amount of other public work. It is stated that having so much work under construction seriously handicapped the City Engineer's office at the beginning of the year, but that the majority of the work has been completed and the remainder will be completed before Feb. 1.

In discussing the pavements in the business section of the city, City Engineer Landreth states that they have been down for a considerable time and were designed for traffic conditions differing materialy from those obtaining at present. He points out that many of the pavements are reaching a point where further repair becomes almost impossible and that when the pavements are replaced the concrete foundations must be materially strengthened. Up to the present time, it is stated, the uniform practice in the city has been to build 6-in. concrete foundations under all pavements, but that such foundations are unable to withstand the present heavy trucking. City Engineer Landreth suggests that in the future the foundation be made at least 9 ins. thick on streets that are subjected to heavy traffic, and that an ordinance be prepared and put into force regulating the weight of vehicles and the size of loads that may be brought on city pavements.

COMING MEETINGS

January 19-21.—Michigan Engineering Society.—36th Annual Meeting, at the University of Michigan, Ann Arbor, Mich. Secretary-Treasurer, Samuel J. Hoexter, Ann Arbor, Mich.

January 20-21.—American Wood Preservers' Association.—Convention, Chicago, Ill. Secretary, F. J. Angier, Mt. Royal Station, B. & O. R. R., Baltimore, Md.

January 27-29.—Illinois Society of Engineers and Surveyors.—30th Annual Meeting, Springfield, Ill. Secretary, E. E. R. Tratman, Wheaton, Ill.

February 9-12.—American Concrete Institute.—Convention at Chicago, Ill. Secretary, E. E. Krauss, Harrison Bldg., Philadelphia, Pa.

February 10-17.—Cement Products Exhibition Company.—Eighth Chicago Cement Show, Coliseum, Chicago, Ill. General Manager, J. P. Beck, 208 South La Salle St., Chicago, Ill.

A meeting of the American Society of Civil Engineers will be held at the Society House, New York, N. Y., at 10 a. m., on Jan. 22, at which a progress report of the Special Committee on Materials for Road Construction and Standards for their Test and Use will be presented for discussion. This committee was originally the Committee on Bituminous Materials for Road Construction, etc., its field having been broadened to include other materials than bituminous by the Board of Direction, which in June of last year ordered the word "bituminous" stricken from the title of the committee.

At the eleventh annual convention of the American Concrete Institute which will be held at the Auditorium Hotel, Chicago, Ill., Feb. 9 to 12, the first day—Tuesday, Feb. 9—will be devoted to the consideration of concrete roads and bridges. Among those who are scheduled to present papers or reports are Percy H. Wilson, Secretary of the Association of American Portland Cement Manufacturers; William H. Connell, Chief of the Bureau of Highways and Street Cleaning, Philadelphia, Pa.; John Mueller, New Castle, Ind.; A. N. Johnson, Highway Engineer, Bureau of Municipal Research, New York, N. Y.; H. J. Kuelling, County Highway Commissioner of Milwaukee County, Wisconsin; Charles E. Russell, City Engineer of Highland Park, Ill.; William M. Acheson, Division Engineer, New York State Highway Commission; E. B. McCormick, Mechanical Engineer, Office of Public Roads, U. S. Department of Agriculture; C. B. McCullough, Designing Engineer, Iowa State Highway Commission, and Willis Whited, Bridge Engineer, Pennsylvania State Highway Department.

Considerable attention will be paid to roads and pavements at the coming annual meeting of the Illinois Society of Engineers and Surveyors, according to the official notice of that meeting. Although the program has not yet been announced, a partial list of papers and reports contains the following relating to highway work: "Paving for Streets Having Car Tracks," by George Bengel; "Economics of Brick and Concrete for Roads," by H. E. Bilger; "Concrete Road at Marquette Hill," by B. H. Piepmeier; "Brick Paving for Rural Highways," by R. L. Bell; "Common Defects in Concrete Road Construction," by A. H. Hunter; "Kinks in Concrete Road Construction," by C. M. Powell; "Estimating Curves for Highway Bridges," by G. F. Burch; "Paving Practice at Springfield;" "Burned Shale for Paving in Parks;" "A Street Having Only One Gutter;" "Concrete Mixing and Distributing in Street and Road Work." It is also announced that an automobile trip has been planned, which will include visits to city pavements and paved country roads in and near Springfield and the plants of the Springfield Paving Brick Co. and the Baker Mfg. Co.

NEWS NOTES

The City Commission of Topeka, Kan., at a recent meeting practically completed its work on the paving program for 1915 In all, about 45 blocks will be paved during the year. Asphaltic concrete and brick are the materials to be used. Several alleys will also be paved with brick.

The Bonding of Ventura County, California, for $970,000 was proposed at a recent meeting held at Ventura, and attended by representatives from various sections of the county. A committee consisting of three members from each of the five road districts was appointed to further the plan.

Plans for the Paving of 33 Streets Have Been Prepared by the City Engineer of Beloit, Wis. It is reported that although asphalt will probably be used bids will be received on concrete and brick. The width of the pavement on West Side streets has been fixed at 30 ft., while most of the streets on the East Side will be paved to a width of 25 ft. It is expected that the large amount of work to be done will result in the securing of lower prices for asphalt if that material is decided upon.

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New Series, Vol. IX

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State Highway Work in New Mexico

According to a statement recently furnished by State Engineer James A. French of New Mexico, the total expenditure for road and bridge construction by the state from July 11, 1912, to November 30, 1914, was $277,322.12, of which $225,678.83 was expended from state funds and the balance, $51,643.29, was from county funds.

The total expenditure included the cost of building 113 miles of graded and surfaced roads, with culverts; 51 miles of graded roads, with culverts; 34 miles of graded roads in canons and mountains, and 159 miles of machine graded mesa roads. It also included $10,954.16 expended for bridge work in Guadalupe, Mora, Santa Fe, Socorro and Valencia Counties. Of the total expenditure of $277,322.12, $128,417.61 was expended in the period from July 11, 1912, to November 30, 1913, and the balance, $148,904.51, during the period from December 1, 1913, to November 30, 1914.

In addition to the expenditures noted above, there was an additional expenditure of $21,308.39, the principal items in which were road equipment, $10,629.22; maintenance and repair, $7,501.79, and bond expense, $2,218.41. The expenditures by counties in 1914 for roads and bridges amounted to $371,196.12.

Money for road purposes in New Mexico may be divided into two classes, the first consisting of money paid into the treasury for use by the State Highway Commission in the construction and maintenance of roads and the second comprising the money raised by the counties for use within the counties. The state funds are derived from a 1-mill levy made on the total assessed valuation of the state, the funds from automobile licenses, one-half of the amount paid by the National Forest Reserve to Grant and Socorro Counties and the funds derived from the sale of state highway bonds. The county funds are derived from the following sources: (1) A levy not exceeding 3 mills for general road and bridge purposes; (2) a levy not exceeding 5 mills for roads specifically designated in the levy; (3) a levy varying with the assessed valuation of the county for building certain specifically designated bridges; (4) a certain proportion of the money derived from the Forest Reserve fund; (5) money derived from the $3 road tax, which is paid either in money or in labor, and (6) money derived from the sale of county bonds.

The funds at present available from these various sources amount to $546,000, of which $175,000 is to be spent by the Highway Commission and $371,000 by the counties. Of this total, $57,815 must be used to pay for bridges already built or now under contract, which will leave available for road work the balance, or $488,185. The tax rates for the general road levies in the various counties range from 0.6 mill to 3 mills and the rates for special roads, except El Camino Real, from 2 to 5 mills. Levies for El Camino Real range from 0.10 mill to 0.65 mill.

Street Improvement in Moline, Illinois

During 1914, 5.6 miles of pavement were laid in the city of Moline, Ill., at a cost of $199,964.96. This brings the total mileage of pavement in the city up to 36.22 miles, all of which has been laid since 1891.

The 1914 work included the construction of 10,199 sq. yds. of concrete pavement at a cost of $14,406.01 and the laying of 66,619 sq. yds. of brick pavement at a cost of $185,558.95.

Plans for work during the coming season include the making of a boulevard of that portion of 19th Ave. between 16th St., Moline, and Longview Park in Rock Island. According to present plans, it will be paved with brick and asphalt, with a center parking. It is stated that when completed it will be the widest thoroughfare in Moline, and will connect with 18th Ave. in Rock Island.

Appropriation of $10,000,000 Asked for New York State Road Work

State Highway Commissioner John N. Carlisle of New York has asked the Legislature for an appropriation of $10,000,000 for road construction during the coming year. This amount, he states, will allow the department to start work immediately on the improvement of the state highways yet to be improved, which have a total length of between 5,000 and 6,000 miles.

Commissioner Carlisle's report for the past year shows that in that period contracts for the improvement of 1,167 miles of highway were let and practically completed. The cost of this work amounted to $19,647,000, a large portion of which was borne by cities and villages in which streets were improved. At the present time, the state's mileage of improved roads is 6,315 miles.

In the report, Commissioner Carlisle also advocates the utilization of convict labor in the preparation of stone for maintenance work, and suggests legislation providing for the collection of motor license fees by the State Highway Department instead of by the Secretary of State. Other suggestions in the report include the taxing of motor vehicles in accordance with the weight and horsepower and the imposition of a mileage charge on motor bus lines.

New Jersey Road Work

According to the report of Col. E. A. Stevens, State Commissioner of Roads of New Jersey, which has recently been submitted to Governor Fielder, nearly $3,000,000 was expended on road work during the past fiscal year.

Of this amount, about $558,000 was distributed from state funds under appropriations dating back as far as 1910 and about $590,000 was expended from the motor vehicle fund. These two items bring the expenditures by the state fund up to something over $1,148,000. The expenditures from county funds amounted to something over $1,455,000. It is stated in the report that as full returns are secured with difficulty in some of the counties it is safe to put the total expenditure at more than $3,000,000.

In the report, Commissioner Stevens states that the department should either greatly reduce its force, limit the work and responsibility of the department to the mere distribution of state money to the local authorities and place on the latter the whole responsibility for the expenditure as well as for the design and construction, or else make the control exercised by the state move effective. He points out that the former would seem to be a step in the wrong direction, the whole tendency of road legislation in this and some of the other states being toward a more centralized control.

Street Improvement in Superior, Wisconsin

During 1914 more money was expended for public improvements in Superior, Wis., than in any other year since the establishment of the city, according to the records of the Board of Public Works. It is also stated that the increase over 1913 is over 100 per cent.

The expenditure for streets, sidewalks, sewers and similar public works in 1914 was $351,944.48, as against $169,935.12 in 1913. Of this total, $192,658.09—a larger sum than the total expenditure for public improvements in 1913—was expended for paving. The expenditures for sidewalks was $33,868.48. During the year there were laid 97,702 sq. yds. of new pavement, consisting of asphalt and concrete. In this connection, it is stated that no more macadam is to be laid in the city, this type of street to be replaced with concrete and asphalt.

In addition to the expenditure for the construction of new pavements, there was expended $60,000 for the maintenance and repair of streets, sprinkling, oiling and the operation of bridges. Sidewalk construction during 1914 included the building of between 12 and 12½ miles of walks. All the walks built were of concrete and varied in width from 3 to 6 ft.

Proposed Road Work in Buchanan County, Missouri

According to a recent preliminary estimate by County Highway Engineer R. L. Cargill of Buchanan County, Missouri, about $150,000 will be expended for road work during the present year. It is stated that if this is carried out the total expenditure of the county during seven years will amount to nearly $1,000,000.

The road fund for the present year will be the largest that the county has ever had, it is stated. The rate of the road tax has been increased from 15 to 18 cts. on the $100 valuation, and this will increase the fund by about $15,000 for the year. The county will have nearly $100,000 for permanent road work from direct taxation, to which will probably be added from $60,000 to $70,000 from other sources.

It is stated that the largest expenditures last year were for grading, which cost, in Buchanan County, about equals the paving cost. The present policy of the county authorities is to grade the main roads to the county line and to complete the paving later. The present administration also favors the construction of concrete bridges and culverts to replace the wood and iron structures, which are wearing out.

NEWS NOTES

A Bond Issue of $100,000 for Street Paving is under consideration in the city of Corpus Christi, Tex. This amount represents the city's share of the cost of the proposed work.

A "Good Roads Day" or a "Good Roads Week" in Pennsylvania has been proposed by the Commercial Secretaries' Association of that state. The present plan is to have the day or week some time in May.

The County Highway System of Tarrant County, Texas, which has been under construction for some time, is practically finished, according to reports. The system comprises about 140 miles of highways, and it is expected that the entire system of main roads will be completed by Feb. 15.

A $200,000 Road Bond Issue is under consideration in Knox County, Kentucky, a petition having been started late in December for an election to be held on March 15. It is stated that a vigorous campaign will be made in the interest of the bond issue and that public sentiment appears to be favorable.

Street Opening and Widening Contemplated in Canton, Ohio, will cost about $50,000, according to the estimates of the Engineering Department. It is stated that this work on a number of streets is essential to the improvement of adjoining thoroughfares, and that the preliminary work has already been done by the Engineering Department.

The County Authorities of Winona County, Minnesota, have established a highway system in the county comprising over 100 miles of state roads. The total cost of the improvement of this system, which will be carried out under the Elwell law, will amount to about $600,000. It is reported that it has also been decided to have the district court, and possibly the supreme court of the state, pass on the legal points involved in the enterprise.

The Board of County Commissioners of Stark County, Ohio, has decided upon a large part of the 1915 road work. According to present plans, the improvements to be made will include the construction of 6½ miles of brick pavement and 8½ miles of macadam. Brick will be laid on the Freeburg-Louisville Road and the Massillon-Millersburg Road. At the time the plans were made, it was expected that contracts would be awarded during the present month.

The Establishment of a State Highway Department in Indiana was recommended in a report recently sumbitted to Governor Ralston by the Indiana Highway Commission, which was appointed some time ago to investigate road conditions in that state. It is reported that the recommendations provide for a commission of three unpaid members with power to engage a highway engineer at a salary not exceeding $4,000 yearly, the expenses of the department to be paid out of the automobile fund of the state.

COMING MEETINGS

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Meetings for Dicussion on the Progress Report of the Special Road Committee of the American Society of Civil Engineers

Two meetings were held at the Society House of the American Society of Civil Engineers in New York on Friday, January 22, for discussion on the progress report of the society's Special Committee on Materials for Road Construction and Standards for Their Test and Use. This report was presented at the annual meeting of the society on January 20.

The committee was appointed by the Board of Direction of the society in May, 1909, and was then designated as the "Special Committee on Bituminous Materials for Road Construction and on Standards for Their Test and Use." This committee consisted of Major W. W. Crosby, Chairman; H. K. Bishop; A. W. Dean, and A. H. Blanchard, Secretary. In June, 1914, the Board of Direction voted to strike out the word "bituminous" from the title of the committee, thus greatly broadening the scope of its activities. Three members were also added to the committee—Messrs. Nelson P. Lewis, C. J. Tilden and George W. Tillson.

The report submitted last week was tendered as a semi-final report on bituminous materials. It includes the conclusions reached by the committee relative to road work with bituminous materials; a list of subjects on which the committee has commenced but not completed investigation; a list of subjects for investigation on which no work has yet been done, and a list of definitions. In addition, there are three appendices. Appendix A comprises the forms originally prepared and adopted by the special committee for reporting on the use of bituminous materials in road work and a set of analyses and methods of testing; appendix B comprises revised forms for reporting data on traffic, and appendix C contains revised analyses and tests for bituminous materials.

The first meeting for the discussion of the report was called to order at about half-past ten Friday morning by President Mars of the American Society of Civil Engineers, who relinquished the chair to Major W. W. Crosby, the chairman of the committee. The discussion was opened by the reading of three written discussions sent in by C. S. Reeve, Chemist, U. S. Office of Public Roads; John S. Miller, and Clifford Richardson, Consulting Engineer, New York, N. Y. Mr. Reeve's discussion was principally upon the chemical tests proposed in the report. Mr. Miller, while devoting a large proportion of his discussion to the same subject, also criticized the proposed definitions at some length; and Mr. Richardson took up various parts of the report but devoted the most of his attention to the list of definitions. The reading of these written discussions was followed by verbal discussions by James Owen, formerly County Engineer of Essex County, New Jersey; Eugene Stern, who will become Chief Engineer of Highways of Manhattan, on Feb. 1; T. Hugh Boorman, Secretary of the American Society of Engineers, Architects and Constructors; W. H. Fulweiler, Chief Chemist, United Gas Improvement Co.; Joseph E. Myers, Chemist, New York State Commission of Highways; William H. Kershaw, Manager, Eastern Division, John Baker, Jr.; P. P. Sharples, General Manager, Tarvia Department, Barrett Mfg. Co.; R. A. Meeker, State Highway Engineer of New Jersey; William M. Kinney, of the Universal Portland Cement Co.; Hunter McDonald, Chief Engineer of the Louisville & Nashville Railroad and Past President of the American Society of Civil Engineers; T. M. Ripley, Division Engineer, Division No. 3, New York State Highway Department; E. H. Thomes, Assistant Engineer, Bureau of Highways, Borough of Queens, New York, N. Y., and Robert A. MacGregor, Assistant Engineer, Bureau of Highways, Borough of Manhattan, New York, N. Y. Messrs. Owen, Meeker and Ripley spoke principally of construction details, and Messrs. Fulweiler, Myers and Sharples discussed the physical and chemical tests in considerable detail. The majority of the other speakers directed most of their criticisms at the proposed definitions. Among the definitions which received particular attention were those for stone, sand and gravel, which were criticized at length by Messrs. Kinney, McDonald, Thomes and MacGregor.

The afternoon session was called to order at about 2 p. m., the discussion of the morning being continued. It was participated in by several of those who had taken part in the discussion of the forenoon and by Bertrand H. Wait, Division Engineer, Division No. 1, New York State Highway Department; G. P. Hemstreet; Major W. W. Crosby; L. L. Tribus, Consulting Engineer of the Borough of Richmond, New York, N. Y.; H. W. Durham, Chief Engineer of Highways of the Borough of Manhattan, New York, N. Y.; W. T. Headley, President, Headley Good Roads Co.; William H. Connell, Chief, Bureau of Highways and Street Cleaning, Philadelphia, Pa., and Arthur H. Blanchard, Professor of Highway Engineering, Columbia University. The discussion in the afternoon was along the same general lines course of macadam with the interstices filled by penetration methods with a bituminous binder."

It will be noted that these agree very closely with the definitions proposed by Major Crosby and with those referred to in our editorial of 1910, to which reference has been made. As we have stated more than once in these columns, it is our belief that these are the meanings sanctioned by the best usage, and it is to be hoped that they find favor with writers and speakers who have to deal with highway work. The two terms macadam and concrete have been very loosely used in the designation of bituminous pavements—as have many other terms employed to describe modern highway work—and for the sake of clearness and accuracy standardization is much to be desired.

HIGHWAY COMMISSION OR HIGHWAY COMMISSIONER?

Among the problems arising in connection with the organization or reorganization of state highway departments is that of the proper administrative head of the department—whether it should be a commission of three or one commissioner. This is particularly timely just now when changes are imminent in some states which already have highway departments, and the establishment of departments seems likely in others which have not yet made legislative provisions for such centralization of authority.

At the Chicago convention of the American Road Builders' Association this question was discussed at some length, first in a paper on "Organization of a State Highway Department," by John N. Carlisle, State Highway Commissioner of New York, and afterwards in discussions on that paper by Paul D. Sargent, Chief Engineer of the Maine State Highway Commission, S. E. Bradt, Secretary of the Illinois State Highway Commission, and W. O. Hotchkiss, State Geologist of Wisconsin and, ex-officio, a member of the State Highway Commission. The views of these four men are of interest—especially when their positions are taken into consideration.

Commissioner Carlisle, the administrative officer of the single-headed New York State Commission of Highways, is unequivocally in favor of the one-commissioner plan, holding that "there is no more reason for three highway commissioners than there is for three governors or three state engineers."

Chief Engineer Sargent was the State Highway Commissioner of Maine when that state first adopted state aid and operated under the single commissioner plan. He has had valuable experience with both methods of administration. In his prepared discussion the advantages and disadvantages of the two systems are not touched upon. But on the floor of the convention, Mr. Sargent, instead of reading his prepared paper, summarized it and took up some points not covered in the manuscript. He agreed with Commissioner Carlisle that a single commissioner can work much more expeditiously than a commission of three and that a single commissioner can probably do his work as efficiently, but doubted if in every case the commissioner can do the work as satisfactorily to the public at large.

Mr. Bradt, who is one of the three members of the Illinois State Highway Commission, expressed himself as in favor of the commission of three. He stated his belief in the possibility of getting better results by selecting such a commission than by trying to get one man possessing all of the requisite qualifications. He held that many of the duties of the commission involve questions wherein the judgment of more than one man is desirable and that the people of a state will generally have more confidence in the judgment of three men than in the judgment of one. He also argued that three commissioners are preferable because a change in administration does not necessarily mean an entire change in the highway department with the attendant interruption of the continuity of the commission's work.

Mr. Hotchkiss also favored the three-commissioner plan. He admitted the advantage of the single executive officer but held that questions of policy and those requiring deliberation are entirely different matters and that they can be handled better by three men than by one.

It will be noted that Mr. Bradt and Mr. Hotchkiss are practically agreed, and that Mr. Sargent's views differ very little from theirs. That the view set forth by Commissioner Carlisle seems diametrically opposed to those of the other participants in the discussion may be due to the fact that although New York does at present have a single-headed commission the administration of highway affairs is largely divided among deputy commissioners.

The opinions so far cited have been those of men engaged in highway work, and it may not be amiss to consider one other expression of opinion on this subject, this time from an executive in another line. In his first message to the New York Legislature, Governor Whitman expressed himself very clearly on this question, as was noted in "Good Roads" for January 16. He stated his belief in the undivided responsibility of a single head as a general principle of government and business, but held that for various reasons highway work in New York can best be administered by a non-partisan commission of three. He laid considerable stress upon the non-partisan idea, holding that the commission should be so constituted that each incoming administration could place upon it a representative without changing the entire personnel of the department. He therefore recommended the creation of a commission of this nature.

In studying these various opinions certain fundamental requirements of the ideal highway organization stand out prominently—the necessity for the final judgment that is the result of careful deliberation; the expeditious and efficient performance of the work in hand; the continuity of policy that is prerequisite to ultimate successful achievement, and the elimination of partisan politics. It is generally agreed, we believe, that the first of these—sound judgment—is more likely to be secured from the commission of three than from the single commissioner, and that work is more apt to be done promptly and efficiently when it is under the control of one head. It would also seem that a commission of three, similar to that proposed by Governor Whitman, could be expected to bring about adherence to a fixed policy and to insure, so far as is practicable, the elimination of party politics. Such commissions exist in several of the states, and many of them have made creditable records. On the other hand, the single-commissioner plan has worked very successfully in some states. Two commonwealths which are often held up as examples of the excellent administration of highway affairs are Massachusetts and New Jersey. The former operates under a commission of three; the latter has a single commissioner. The cases of other states could be cited to prove either side of the question.

From the evidence at hand, it would seem that the most satisfactory solution of the problem is a combination or modification of the two systems whereby the larger questions of general policy are handled by a commission of three or more members and the actual carrying out of the policy is entrusted to an executive official who is answerable only to the commission. Such a system is in force in a large number of the states—in fact in most of them that do not operate under the single-commissioner plan—and its workings have proven generally satisfactory.

The City of Columbus, Ohio, according to a recent statement, paved or repaved about 22 miles of streets during 1914. Most of the pavements built were of brick or asphalt, the mileage being about equally divided between these two materials.

Papers Presented at the Eleventh Annual Convention of the American Road Builders' Association

In the issue of January 2 we presented a report of the Fifth American Good Roads Congress and Eleventh Annual Convention of the American Road Builders' Association, in which were included three of the technical papers, together with the verbatim report of the discussions following their presentation. We also stated that the remaining technical papers would be printed in the issue of February 6 and that they would be accompanied by a presentation of the discussions following them.

In accordance with that announcement, we print in the following pages eight of the eleven remaining papers and also brief summaries of the discussions. The printing of the other three has had to be deferred to the issue of March 6, on account of lack of space in this issue. The full text of the stenographic report of the discussions will be printed with the complete papers in the official proceedings of the A. R. B. A.

ORGANIZATION OF A STATE HIGHWAY DEPARTMENT

By JOHN N. CARLISLE

State Commissioner of Highways of New York

The first and most important problem in connection with the question of the organization of a state highway department is a study of the amount of work which it will be called upon to do, the extent of the territory which it will have to cover, and the amount of money available for construction and maintenance purposes.

These different phases vary so greatly in the different states that it would be absurd to try and outline an organization that would apply to every state in the Union.

A study of the organization of the department in New York State may assist in the discussion.

Our first roads were built under the direction and control of the State Engineer and Surveyor, an elective officer. In 1909 there was created a commission of three members, appointed by the Governor, for a term of six years each, one member going out every two years. In 1911 this law was repealed and a new commission created, consisting of the State Highway Commissioner, appointed by the Govenor, the State Engineer and Surveyor, elected by the people, and the Superintendent of Public Works, appointed by the Governor.

The theory of this Commission was that all the state work of construction should be collected together under the control of the heads of the different departments doing state construction work.

In 1913 this law was repealed, and the organization of the department was made as follows: A commissioner, appointed for five years, and three deputy commissioners; the first deputy to have charge of the preparation of plans and the construction and building of state and county highways; the second deputy to have charge of the maintenance of the state and county highways, and the third deputy to have charge of the town bureau, having supervision over the balance of the roads in the state known as the town roads.

The law also provided for a secretary and an auditor for the department.

At the main office there is a bureau of tests, having charge of the testing of all materials used upon the roads; an engineer in charge of the preparation of plans for bridges throughout the entire state, and an efficiency engineer charged with collecting data regarding roads both as to cost of maintenance and construction and the tabulating of traffic statistics.

Nine divisions were created in the state, each under the charge of a division engineer who has control of both the construction and the maintenance work in his division.

Under each division engineer is at least one resident engineer and a sufficient number of assistant engineers, levelers, rodmen, chainmen, axemen and inspectors of construction. These are all civil service appointees and the inspectors of construction are required to be residents of the county in which their work is being done. Our maintenance work is done both by patrolmen and by section gangs under the supervision of civil service employees.

There are already built and constructed in New York State approximately 6,000 miles of state and county highways, and to appreciate the volume of work necessary in connection with the maintenance of these roads alone, it must be understood that these roads, if extended in a single line, would reach from New York to San Francisco; from Montreal, Canada, to Miami, Florida, and there would still be enough mileage left over to duplicate the improved roads of Massachusetts and Connecticut.

In 1914 the department constructed or awarded contracts for a road which would reach from New York to Milwaukee. The total mileage to be constructed is approximately 12,000 miles so that about one-half only of the system has been completed.

In 1913 the payments to contractors for new roads were $12,257,001.93 and this year it will exceed $13,500,000.00. The payrolls during the construction period average about $1,900,000.00 per month and this season over $4,000,000.00 will be expended for maintenance.

No other state will, undoubtedly, ever transact the great volume of work being carried on in New York, and the only object in setting forth the organization and the amount of work done is to bring out the point, that other states with similar territory and very little money available could not possibly support such an organization as does the state of New York.

In addition to the work now intrusted to the present Highway Department of the State of New York, there should also be added the duty of the collection of the automobile tax, which is used entirely for maintenance, and the enforcement of the motor traffic regulation laws.

Taking into consideration the future history of highway construction in the United States, the following duties in my opinion ought to be performed by state highway departments:

1st. Construction of state and county highways paid for in whole or part by the state.

2nd. Maintenance of the same.

3rd. Approval of the location of all roads to be improved by state aid.

4th. Supervision of all town highway work, including the expenditure of all moneys therefor.

5th. Collection of motor license fees and any other fees used for maintenance purposes.

6th. Enforcement of motor traffic regulations.

Organization Suggestions

1. There will always be an argument as to whether the head organization should be a commission composed of several members or a single executive head. My own opinion is that there should be only one commissioner. There is no more reason for three highway commissioners, than there is for three governors or three state engineers.

The head of a highway department, doing a large amount of work, must necessarily be a purely executive, administrative officer, and in a large state like New York it is impossible and it would be impracticable, for a highway commissioner to try and give any attention to engineering details. His time is necessarily spent in looking at the large problems connected with his department; seeing that his force is properly organized and properly working; that the routes of roads are correctly laid out; meeting with delegations from different sections of the state; settling disputes between contractors and localities where roads are being built, and in passing upon final acceptance and payments on the roads. In a small state, where the work is concentrated, a commissioner of highways might properly give attention to engineering details, but in a large state, where his duties are so involved, the head of the department should be an executive, administrative officer only.

2. Under the commissioner should be a sufficient number of deputies to take care of all of the details of the work intrusted to the department. One of the deputies should be designated as chief engineer and should have charge of the details of all the engineering work of the department.

3. There should be a secretary having charge of the correspondence, records, and clerical work and an auditor having charge of the authorization for and the accuracy of every expenditure of state funds.

4. Every state ought to have a bureau of tests where all material to be used in the construction of its roads shall be passed upon by its engineers. In New York State when a road is ready to have plans prepared, an engineer connected with the bureau goes upon the ground and examines all sources of materials and upon his report the division engineer then decides upon the type of the road. All materials of every kind are required to be tested before they are placed and this work can be done more quickly and efficiently than if passed upon in any other way.

5. The state should be divided into a sufficient number of divisions with division engineers in charge, so that the work can be closely supervised on the ground. Under the division engineers should be such a force of engineers and other employees as may be needed. The entire work of construction and maintenance in each division should be under the division engineer and the entire engineering force should be protected by civil service laws so as to provide for continuous service.

6. A bureau having supervision of all town roads of the state, that is all roads outside of those improved by state aid, should be established. In New York State there are approximately 75,000 miles of road. With the $100,000,000 to be raised by bond issues, only about 10,000 miles will be improved, leaving 65,000 miles to be taken care of by local communities.

To assist the towns in improving this large mileage, the state for years has contributed directly to the towns an amount of money in addition to that raised by the towns locally. This amount is fixed by statute, the amount payable by the state to each town being based upon the assessed valuation per mile and the amount annually raised by the town for highway purposes. The towns have gradually been taking advantage of this act until within the past year the state's share amounted to $1,800,000, and when the towns take full advantage of the act the amount will be $2,199,177 yearly. The amounts asked for by the towns have been constantly increasing year by year, showing that they realize the advantage to be gained by raising the maximum amount in each town in order to obtain the maximum amount of state aid.

The Town Bureau of the State of New York has supervisory power over the expenditure not only of the moneys contributed by the state but also of the moneys raised locally for highway purposes. One of the deputies is in charge of this bureau, and the state is divided into ten districts, with a district supervisor in charge of each, who is required to constantly go about his district and observe the work of the town officials. The law requires that town officials shall keep uniform systems of accounts upon blanks furnished by the department; that written contracts shall be entered into determining the places where and the method in which the highway moneys shall be expended in each town; and copies of these agreements are required to be filed in the department.

A yearly examination of the accounts of each town is made by the district supervisor so that the department will know that the money has been properly expended, and a yearly report is required of each town covering the details of the expenditure of the money.

To properly supervise the expenditure of these moneys the state requires that a certain amount shall be expended each year in each town for permanent types of construction, and is constantly advising the town officials in regard to types of construction of roads, plans for bridges and drainage and culvert structures.

The work of this bureau is not as well understood as some of the other departments of the state, but it is believed that the expenditures of the state's money in this direction and the supervision by the department has resulted in a wonderful improvement in general road conditions throughout the state; and every state ought to make a careful study of the methods adopted in New York State along these lines.

No state highway department will be propertly organized if it has jurisdiction over only a few of the roads which are to be improved by state aid. No state can ever bear the burden of improving all of its roads. The most important roads, as in New York, will be built entirely at the expense of the state. The next, or secondary roads, should be built, as in New York, by the state, but with the aid of the counties. To carry out the road problem to its final solution, the balance of the roads must be taken care of, as in New York, by the organization of a town bureau, and giving state aid directly to the towns. Only in this way can the entire system of roads in a state be given the attention which it deserves.

Summary of Discussion

Paul D. Sargent, Chief Engineer of the Maine State Highway Department, was the first speaker in the discussion of Mr. Carlisle's paper. In opening the discussion, Mr. Sargent said that the organization of a state highway department was in many respects similar to a problem in road construction—that each individual problem depended upon certain conditions. He expressed the belief that if the selection of the roads to be improved is left to the highway department it will generally be made more carefully than it will if it is made by the Legislature, and that such work can best be handled by a commission of three or more members each representing a different interest.

Continuing, he sketched briefly a model organization having a division of surveys and plans, a division of design and construction, a division of maintenance and an accounting division. Mr. Sargent outlined the duties of each division and the qualifications of the officials and employees in those divisions. He believed that in general the chief executive officer of a state highway department, who would usually be the chief engineer, should have a good working knowledge of all lines of engineering, but must also be a good executive. This officer, according to Mr. Sargent's plan, would have general oversight over all of the department's operations. Mr. Sargent also believed that the territory under the jurisdiction of the commission should be divided into several geographical divisions, each of such size that the division engineer could cover it for inspection purposes at least once every two weeks. These division engineers, according to Mr. Sargent, should be responsible to the chief engineer and should be men of such ability and experience that they would be willing to pass on all routine matters, thus materially relieving the chief engineer and the chiefs of the divisions of construction and maintenance of a considerable amount of inspection and field work, leaving them more time for general administrative and executive work.

S. E. Bradt, Secretary of the Illinois State Highway Commission, followed Mr. Sargent, discussing the problem largely as it applied to the State of Illinois. Mr. Bradt favored a commission of three rather than a single commissioner for the administrative head of the department. He argued that this plan would better provide for obtaining the qualities desired than would the selection of one commissioner; that the people of the state would have more confidence in the judgment of three members than in the judgment of one, and that continuity of policy would more probably be secured by three than by one, since if the terms of office of the three were made to expire in different years the changing of one man would not interfere so much with the work as it would were one man at the head. He expressed the belief that if some plan could be devised for appointing a non-partisan commission it would be beneficial, but held that so far no more satisfactory plan has been developed than the appointment of the commission by the state executive. The term of office, he believed, should be six years, the term of one commissioner expiring every two years. He also expressed the belief that it is often possible to secure the services of men who will give a part of their time to their duties without pay, and that where this is feasible it is often advantageous. Mr. Bradt agreed with Mr. Sargent that the active work should be under the control of a chief engineer; that this official should be appointed by the commission and should serve during "good behavior," and that he should have not only the technical qualifications, but that he should also be a man of experience and good judgment.

Sub-divisions of the department, according to Mr. Bradt, should consist of a road division in charge of a road engineer, a bridge division in charge of a bridge engineer, a laboratory division in charge of a chief chemist, a statistical division, an accounting division under a chief clerk and, when a publication is issued by the department, an editorial division.

W. O. Hotchkiss, Secretary of the Wisconsin Highway Commission, also favored the commission of three, with the execution of the work delegated to a chief engineer or similar official. Mr. Hotchkiss made the point that there is the fundamental difference between a state highway department and other engineering organizations that, while the ordinary engineering organization is formed for the accomplishment of certain work for private interests and is not concerned with the public's opinion of it or its work, the highway engineer is a public servant and must have regard for the opinion of his work held by the public. Mr. Hotchkiss stated that the highway engineer who goes out and builds a good road and leaves with the people of the locality in which the road was built the impression that he has done wrong—that he has built too expensive a road or that he has been arbitrary—has done a poorer piece of engineering, from the standpoint of a state highway department, than the man who goes out and builds a moderately good road, doing the work in such a way that the people of the locality are in a frame of mind to go ahead with road work. According to Mr. Hotchkiss, there must be instilled into the mind of every member of a highway department the idea that he shall not be merely a road builder but that he shall be an educator of the public.

Mr. Hotchkiss also expressed himself as strongly in favor of the commission which serves without salary. He stated that he had taken occasion to discuss this matter with a great many public men and with others and that he had found as a result of his inquiry that there is a feeling on the part of many men that they are willing and glad to give a moderate amount of their time to an enterprise which is for the public benefit. He said that he believed that such a commission is the best commission which it is possible to get if the men are chosen rightly.

TRAFFIC; PRESENT TENDENCIES, PROBABLE DEVELOPMENT AND REGULATION

By A. W. DEAN

Chief Engineer of the Massachusetts Highway Commission

A quarter of a century ago bicycle riding became a popular means of securing exercise and pleasure, and the riders became so numerous that a great impetus was given to the previously dormant interest in roads. Agitation started at that time brought about a considerable amount of road improvement, sufficient to show to the users of horse-drawn vehicles that a good road was beneficial not only for the pleasure of the cyclist, but for the business of the team owners, consequently there was an added interest in road improvement, and when motor vehicles came into general use this interest was, of course, several times compounded. The desire and necessity for good and permanent roadways is bound to increase in the future, not particularly to furnish pleasure to the automobile enthusiasts, but also to facilitate the movement of commerce between neighboring points.

The number of horse-drawn vehicles using the highways is not materially changing, while the number of motor vehicles is increasing greatly.

Proof of this is shown by comparing two traffic censuses taken by the Massachusetts Highway Commission at intervals three years apart. Adding the traffic of two dozen stations selected at random, it is found that in three years the number of horse-drawn vehicles passing these stations decreased in three years from 4,547 to 4,455, or about 2 per cent., while the number of motor-driven vehicles increased from 3,708 to 11,198, more than threefold. The period covered by the foregoing was between the years 1909 and 1912, and it may be fairly assumed that the proportion of change since 1912 has been similar. This assumption is borne out by a comparison of the number of motor vehicle registrations made each year, table of which is here given.

STATEMENT SHOWING THE NUMBER OF MOTOR CARS REGISTERED, 1906 TO 1914. MASSACHUSETTS HIGHWAY COMMISSION.

	1906	1907	1908	1909	1910	1911	1912	1913	1914
Automobiles (pleasure) ..	6572	7733	18066	23011	29792	36284	46096	56712	68100
Dealers' Automobiles	755	455	1905	2455	3305	4920	6301	7462	7898
Trucks	....	....	....	960	1568	2623	4036	5948	8053
	7327	8188	19971	26426	34665	43827	56433	70122	84051

It does not appear to be necessary to add anything to the foregoing to show clearly the present tendency of traffic so far as relates to type and quantity, except to express the opinion that in large cities the increase in motor-driven vehicles may be somewhat greater.

The table shows the increase in numbers of motor trucks to be in large proportion annually, and it may be expected that with the improvement in development of the machinery and the increased use found for motor trucks, the percentage of motor trucks as compared with that of other motor vehicles will increase rapidly. The capacity in tons of motor trucks is being increased annually, so that at the present time it is no unusual thing to have a truck, including its load, weighing 10 tons or more, passing over the highways and bridges. In the vicinity of the docks in Liverpool loaded vehicles weighing 30 tons are not unusual. This probable development in motor truck traffic cannot be and should not be prevented, except within certain limits. Many bridges are not of sufficient strength to carry safely even a 10-ton load, consequently, there should be a restriction in the weight of vehicles, and there should also be requirements fixing the minimum loading for which new bridges should be designed. Building laws in many cities and towns require that when a building is altered or constructed, it shall conform with certain requirements. A similar law should be passed in relation to bridges in order to permit the use of heavier vehicles than can now be safely used. Emphasis need not be placed on the fact that the roadways constructed hereafter should be designed with sufficient strength and proper material to withstand the heavier loads. On the other hand, unless some restriction is placed upon the weights of loads that are to be permitted to be carried over the highways and bridges, there will be a tendency to develop excessively heavy trucks such as are used, as already mentioned, in Liverpool. The Legislature of Massachusetts in 1913 anticipated the necessity for regulating the weight of traffic and passed an act, a portion of which reads as follows:

> No traction engine, trailer, motor or other vehicle shall be operated upon or over a highway or bridge in any city or town in this commonwealth, nor shall any object be moved over or upon any such highway or bridge, upon wheels, rollers or otherwise, in excess of a total weight of fourteen tons, including vehicle, object or contrivance and load, without first obtaining the permit mentioned in section three of this act from the authority or authorities therein mentioned; nor shall any vehicle be operated or contrivance moved upon or over said highways or bridges which has any flange, ribs, clamps or other object attached to its wheels or made a part thereof, which will injure, cut into or destroy the surface of the highway or bridge for any considerable depth; and in the towns of the commonwealth outside of the metropolitan parks or sewerage districts no such engine, vehicle, object or contrivance for moving heavy loads shall be operated or moved upon or over any such highway or bridge the weight of which resting upon the surface of said highway or bridge exceeds eight hundred pounds upon any inch in width of the tire, roller, wheel or other object, without first obtaining said permit, unless such highway or bridge is paved with brick, block, sheet asphalt, concrete pavement or surface. The owner, driver, operator, or mover of any such engine, vehicle, object or contrivance over said highway or bridge shall, unless relieved from liability in said permit, be responsible for all damages which said highway or bridge may sustain as a result of said action on his part, and the amount thereof may be recovered in an action of tort by the authority or authorities in charge of the maintenance or care of said highway or bridge, or by the authorities of the town, the Massachusetts Highway Commission, or the County Commissioners which have charge of the highway or bridge which is injured.
>
> No steam traction engine, with or without trailers, and no motor truck carrying a weight in excess of four tons, including the vehicle, shall be operated upon any highway or bridge in this commonwealth at a speed greater than fifteen miles an hour; and no such vehicle carrying a weight in excess of six tons, including the vehicle, shall be operated upon any such highway or bridge at a speed greater than six miles an hour when such vehicle is equipped with iron or steel tires, nor greater than twelve miles an hour when the vehicle is equipped with tires of hard rubber or other similar substance.

The remainder of the act provides that the authorities having control over any road may grant permits for moving vehicles weighing more than fourteen tons, but when such permit is granted, it is provided that the person to whom permit is issued shall be responsible for any damage that may be done to highways or bridges. The act also provides a fine of $100 for each and every offence. While this act may not be perfect, it is of great assistance in regulating traffic of heavy vehicles, and is here given as a recommendation for general adoption.

Summary of Discussion

Mr. Dean's paper was discussed by C. A. Kenyon, President of the Indiana Good Roads Association, who took up the subject from the standpoint of regulation.

Referring to the public interest taken in the subject of health and the steps taken by states and cities to prevent and care for disease, he called attention to the large number of injuries and deaths on the highways and said that we did not seem to be paying very much attention to the matter. According to Mr. Kenyon, we are willing to charge railroad managers, manufacturers and others with the wanton destruction of human life and are willing to pass all sorts of laws to curb, punish and regulate them; but when it comes to imposing regulations upon the general public for its own good it is regarded as an unwarranted interference with personal liberty.

Mr. Kenyon said that necessity has driven us to provide some sort of traffic regulation and traffic officers in cities, but these laws are difficult to enforce and everyone seems at liberty to disregard them whenever it can be done with impunity. He asked if the deaths and injuries at grade crossings, for instance, were not the result of the absence of any state authority charged with the duty of gathering statistics and making reports, or the making of a "safety first" organization for the public benefit. He expressed the belief that every state highway department should have a public safety division to deal with the question. As remedies for these conditions, Mr. Kenyon proposed some official body to study the hazards of the road, to formulate traffic recommendations, to recommend safety appliances and to educate the public; and also the study of the dangers of road and bridges, the designing of structures, and methods of safeguarding them. In closing he emphasized the necessity for using and maintaining the safeguarding devices after they have been provided.

BRICK ROADS AND STREETS

By **JOHN LAYLIN**

Division Engineer, Ohio State Highway Department

This paper will treat this subject largely from the writer's experience in municipal and state highway improvement work.

Ohio statutes provide for state aid in road building on a system of inter-county highways, so-called, lying wholly without the limits of municipalities, comprising a network of roads aggregating about 9,500 miles, and connecting all county seats and towns of any considerable size within the state.

The law is very flexible in regard to the distribution of costs of improvements, and was designed to meet all possible conditions, but in a general way it may be stated as 50 per cent. to the state, 25 per cent. to the county, 15 per cent. to the township and 10 per cent. to abutting property. County commissioners designate the particular section of the particular inter-county highway that shall be improved in any year and guarantee the payment of costs to be levied against the county, township and property owners, and further determine the particular type of improvement to be made.

Inasmuch as the county commissioners are a party to every contract made and entered into, it may be readily understood that the Highway Commissioner does not select the particular type of pavement to be constructed, even if inclined so to do. Types of pavements are generally selected, however, that best suit traffic conditions and utilize suitable materials near at hand.

The Highway Commissioner has ever tried to treat all material and supply men with the utmost fairness, and his splendid success in the management of the department and the construction of a great highway system is largely due to the hearty cooperation of all classes of material and supply men.

After a type of pavement has been selected for a section of road to be improved, then the Commissioner does insist that the construction of the work shall be of the best for that particular kind of pavement.

The essentials of a good road or street are good alignment, easy grades and perfect drainage.

Resident engineers working under the directions of department division engineers make the field surveys, plat the alignment, profiles and cross sections, and work out all questions of new locations, grades, cross sections, sewers and drains, bridges and culverts, and plans are made to show type and dimensions of foundation, thickness of sand cushion, kind and dimensions of curbing, kind and thickness of expansion joints, all details of drainage, bridges and culverts, and everything not fully set forth in the general specifications of materials and workmanship.

In passing, it might be said that efforts are always made to secure a clear sight view of at least 300 ft., a maximum gradient of 8¾ per cent., and a drainage system that will maintain a water level well below the base of foundation of pavement.

The 1914 specifications for brick pavement improvements provide as follows:

That in the preparation of the subgrade, all muck, quicksand, soft clay and spongy materials that will not consolidate under the steam roller shall be removed; that backfilling of all excavations shall be rammed in courses of not more than 6 ins. of loosely filled earth; that embankments shall be built up from the bottom in successive, even layers not exceeding 12 ins. in thickness; that each of these layers shall be rolled until thoroughly compacted; that when the slope upon which material for embankment is to be placed exceeds two to one, such slope shall be furrowed before any material is placed thereon, and that areas on which embankments less than 1 ft. in depth are to be placed, shall be broken up by plowing or other means.

After the surface of the subgrade has been properly shaped the roadbed shall be thoroughly rolled and compacted so that it does not wave or spring under the roller. Rolling shall be done with a self-propelled roller weighing not less than 6 tons.

That foundation for pavement may be made of either Portland cement concrete, old pavement, compacted broken sandstone, limestone, slag, gravel or vitrified clay.

Great care is to be used in selecting aggregates for concrete, all materials being submitted to tests to insure quality meeting requirements as specified in Bulletin No. 25, "General Specifications for Materials."

Aggregates are so proportioned as to produce concrete, substantially composed of 1 part cement, 2½ parts fine and 5 parts coarse aggregates, in which the mortar shall be not less than 110 per cent. of the volume of the voids in the coarse aggregates.

Coarse aggregates may consist of crushed bowlders, crushed limestone, slag or gravel that will pass a screen having openings 1½ ins. in diameter and be retained upon a screen having openings ¼ in. in diameter.

A cubic yard of concrete in place shall not contain less than five sacks of cement.

Concrete shall be mixed in a batch mixer, so-called, the drum of which shall not make less than 15 revolutions, at a speed of between 15 and 20 revolutions per minute.

Materials shall be mixed sufficiently wet to produce a concrete that will require no tamping. Subgrade must be moist before concrete is placed thereon.

The surface of concrete shall be shaped by the use of a suitable templet cut to conform to the crown of pavement, and shall be floated in such a manner as to thoroughly compact the concrete and produce a surface the exact crown specified. The finished surface of the concrete shall conform so nearly to that indicated on the plans that it will nowhere vary more than ½ in. from the previously described templet or a 10-ft. straight-edge applied to the surface of the concrete and parallel with the center line of the pavement.

Care shall be taken to protect concrete from rapid drying out and freezing, and traffic is prohibited for 10 days from time of laying.

A thoroughly consolidated old macadam or gravel road, if of sufficient depth, may be considered satisfactory pavement foundation. The old road shall be thoroughly cleaned, and if irregular, shall be scarified, graded to the proper elevation and all depressions filled with the same material of which the course consists. All foundation material placed must be thoroughly filled, water-bound and compacted.

Rolled foundation shall consist of either gravel, broken sandstone, limestone, slag or vitrified clay. Sandstone fragments must not exceed 6 ins. in greatest dimension, and all other materials must pass a screen having 4-in. circular openings and be reasonably well graded from 4 ins. down to the smallest size found in the product.

Gravel shall not contain more than 15 per cent. of clay or loam.

Rolled foundation shall be constructed as a one-course water bound macadam pavement and brought to the proper crown and grade within the limits specified for concrete foundation.

That curbing shall be either sandstone or concrete of dimensions indicated on plans and quality as specified in said Bulletin No. 25.

That sand cushion shall not contain more than 8 per cent. by weight of clay or loam. Sand shall be spread over foundation, shaped with templet, rolled till compact, and made ready to receive the paving blocks.

That paving blocks shall be laid in an upright position upon the sand cushion in straight courses across the road, and shall be laid so that the longitudinal joints are broken approximately at the center of each block and the long dimension of the block is perpendicular to the center line of the road on the tangents and practically parallel with the radius of curves having a radius not greater than 150 ft.

All blocks to be laid with the lugs in the same direction and set as closely together as possible. In all cases the end joints shall be made close and tight, the joints to be at right angles to top and sides. The cutting and trimming of blocks shall be done by experienced men, and proper care shall be taken not to fracture or injure the part to be used.

After a sufficient number of blocks shall have been laid, the pavement shall be thoroughly dampened by sprinkling, and all soft, porous or unacceptable blocks will be marked by the inspector and shall be removed by the contractor. When any section shall have contained more than 10 per cent. of rejections, the blocks of the entire section shall be taken up and the cushion re-adjusted. As soon as possible after the block in the pavement is inspected, rejections removed and replaced with acceptable block, the surface shall be swept clean and then rolled with a self-propelled roller weighing not less than 6 tons. When rolling and ramming are completed, the surface of pavement shall conform so closely to that indicated on the plans, that it will nowhere depart more than ⅜ in. from properly formed templet or a 10-ft. straight-edge applied to its surface.

Soon after the pavement has been compacted and surfaced, the joints between the blocks and the curb shall be filled with a grout filler composed of one part Portland cement and one part sand. Detailed specifications set forth manner of applying grout.

Paving brick specifications provide:

That the brick shall be standard wire-cut-lug or repressed paving block of standard size. The standard size of brick shall be 3½ ins. in width, 4 ins. in depth and 8½ ins. in length. The brick shall not vary from these dimensions more than ⅛ in. in width and depth and not more than ½ in. in length, and the brick of the same shipment shall not vary more than ⅛ in. in width or depth. They must be thoroughly vitrified and annealed, regular in size and shape and uniformly burned. When broken, they shall show a dense, stone-like body, free from lime, air-pockets, cracks and marked laminations. No surface of any brick shall have kiln marks more than 3-16 in. in depth or cracks more than ⅝ in. in depth, and the wearing surface of the brick shall not have kiln marks more than 1-16 in. in depth and shall be free from cracks. The brick shall have not less than four nor more than six lugs, all on one side of the brick, such that when the bricks are properly laid in place in the pavement, the joints between the brick will be not less than ⅛ nor more than ¼ in. in width. The name or trade mark of the manufacturer, if shown on such brick must be by a recessed design or by recessed letters and not by a raised design or raised letters.

If the edges of the brick are rounded, the radius shall not exceed ⅛ in. The brick must not be chipped in such a manner that neither wearing surface remains intact or that the lower or bearing surface is reduced in area by more than one-tenth, but such brick, if otherwise satisfactory, may be used in obtaining the necessary half brick for breaking courses and the necessary pieces of brick for closures; provided that the wearing surfaces of the part of brick used shall be intact. The brick shall not be glazed. To determine whether the material of the brick as a whole, possesses, to a sufficient degree, strength, toughness and hardness, samples of the brick shall be submitted to the rattler test. The test shall be made in accordance with the method and in a rattler as described in the recommendations by the Submittee on Paving Brick to the American Society for Testing Materials. Five samples of each kiln or shipment may be selected; one sample from what appears to be the softest brick and one sample from what appears to be the hardest brick, neither of which shall lose of their weight more than 24 per cent.; and three samples representing an average of the kiln or shipment which shall lose of their weight not more than 22 per cent.

The quality of the brick shall be of such uniformity that the range between the highest and lowest loss by abrasion shall not exceed 8 per cent. If the kiln or shipment of brick should fail to meet the above requirements, and it is fair to assume that it would meet them, if not more than 10 per cent. are culled, then the contractor may, at his option regrade the brick. When the regrading is complete, the kiln or shipment shall be resampled and retested, as under the original conditions, and if it fails to meet any of the above requirements, it shall be finally and definitely rejected. Sampling may be done at the factory prior to shipment and brick accepted as the result of such sampling will not be rejected as a whole but will be subject to such culling as may be necessary to meet all of the requirements except that of the rattler test.

The Ohio State Highway Commissioner let contracts for brick roads in 1912, 1913 and 1914, mileage as is shown in the following table:

	1912	1913	1914
Mileage brick roads contracted	33.47	27.71	164.0
Per cent. brick road of total mileage of all roads	20.7	17.7	32.5
Contract price for brick roads	$507,899.19	$486,925.87	$3,415,584.45
Per cent. of total contract price of all hard surfaced roads	36.4	35.3	46.3
Average contract price per mile for brick roads	$15,680.00	$17,572.00	$20,827.00
Average contract price for brick roads per foot in width per mile	$1,150.00	$1,379.00	$1,364.00

The contract price for brick roads included grading, draining, curbing, and paving for the years 1912 and 1913, but also included bridges and culverts for the year 1914.

In the preparation of our plans it is our endeavor to embody the use and requirement of the best possible foundation, and the best possible drainage consistent with the economy of the road.

Following this rule, a concrete foundation for brick pavements is generally provided, and as the greatest assurance against longitudinal cracking in the wearing surface, the advantage of a dry sub-base is considered essential. It is the general belief that brick pavement cracks are caused more by frost action than high temperature stresses. In fact, a sufficient and proper drainage of the subgrade of all roads, including the brick road, is regarded as of the utmost importance. Frost has little effect where moisture is almost entirely absent; hence these provisions carefully observed are certain to reduce to a minimum all deleterious climatic effects.

There are a few examples of brick pavement construction that the writer especially desires to call to attention.

The Cleveland-Buffalo I. C. H. No. 2, in Lake County, is a 2½-mile improvement with brick surface 18 ft. in width, curbed on either side, with a 24-in. concrete gutter having a 2½-in. concave surface. These gutters collect the water that falls on pavements and lawns and conduct to catch-basins connected with a system of underground drains. The pavement is laid on a 4½-in. concrete foundation. The lawns slope back from gutters and the park-like effect is very pleasing.

Many of the brick pavements in Northern Ohio on streets and roads having a sandy or gravelly soil, are laid on natural bed foundations, and where traffic is light or medium, such streets are giving first-class service. Many such streets have been been in use 20 years and more, and they give every evidence of being good construction.

Two streets in Norwalk, Ohio, have been laid on natural bed foundations and edged with vitrified curbs. These curbs were made on a regular paving brick machine with three out of four of the cutting wires removed, thus making a block that when burned was 4x8½x15½ ins. These blocks were set with the 8½-in. dimension vertical and set in gravel or crushed limestone.

The pavement when grouted with a 1:1 cement mortar practically became monolithic. This work has been in place less than two years, but it looks like good, cheap pavement construction. The writer has watched for a number of years two streets in a small village that were curbed with ordinary paving block stood on end and thoroughly grouted. The earth next to such blocks has worn away in places and the edges of bricks have become rounded, but they are still doing business and holding the pavement intact.

A number of Ohio roads have been designed and constructed with concrete foundation and curb constructed monolithic, and such construction is to be recommended.

Cuyahoga County, Ohio, is noted for its brick country roads, there being over 350 miles outside of the City of Cleveland. These roads have generally been constructed 14 ft. in width, located on the side of the roadway, the balance of roadway being graded to a width of 7 ft. or more and used as an earth drive.

The earlier roads built were constructed with rolled foundations and not very much attention was paid to matter of drainage, but brick roads as now constructed are well drained and provided with concrete foundations. Concrete and sandstone curbing is employed, and in all cases the pavement slopes so the surface drainage flows away from the earth track. Raised curb is often used on the outside, and on hills raised curbs are used on both sides of pavement, drainage being provided by catchbasins and underground drains. On hills, hillside block and Medina block are used. Traffic is very heavy in and about Cuyahoga County, and the brick roads seem to have solved the road problem.

In conclusion, it may be said that brick roads and streets should always have a solid subgrade, perfectly drained; that a concrete foundation should be provided wherever traffic conditions are heavy, and that the surface of concrete foundation should be made true and smooth and exactly parallel with the crown of the street: that the sand cushion should be thoroughly compact and from 1½ to 2 in. in thickness, that a cement grout filler is the best filler; and that a brick road is a dependable road.

The paramount interest in brick roads that more greatly concerns the tax paying public is the same that is involved in the expenditure for any road no matter what the type, and that is the efficient building of the road itself, the compliance with the plans and specifications. The proper construction of a brick road is no more difficult than the construction of any other kind of road, but every requirement of the plans and specifications should be carried out. Plans, specifications and contract pre-suppose that each and every requirement therein is a part and parcel of a necessary adjunct to the value of the road intended to be built. A complete cooperation of the combined influences of public sentiment, official authority and the obligation of the contractor is necessary to reach the ideal in road building. Without the combined forces of all, the most conscientious official, the most diligent contractor or an anxious public acting singly and alone cannot attain the best results.

Summary of Discussion

Mr. Laylin's paper was discussed by William M. Acheson, Division Engineer, New York State Highway Commission; Leonard S. Smith, in charge of the Department of Highway Engineering, University of Wisconsin; Major W. W. Crosby, Consulting Engineer, Baltimore, Md.; W. P. Blair, Secretary of the National Paving Brick Manufacturers' Association; M. F. Bramley, President of the Cleveland Trinidad Paving Co., Cleveland, Ohio, and others.

Mr. Acheson, who spoke first, devoted his remarks to construction details, taking up first the preparation of the subgrade, which, he said, is one of the most important details of the construction of any pavement, but perhaps particularly of brick. In the preparation of the subgrade, according to Mr. Acheson, thorough provision should be made for drainage, especially in cuts; tile drain should be installed where necessary, well below the frost line, and proper ditches should be provided. In fills, the material should be deposited in layers of a maximum thickness of 6 ins. and should be rolled with a grooved roller, while in cuts particular attention should be paid to the character of the soil in order to avoid soft, spongy spots. Mr. Acheson also emphasized the necessity for finishing the subgrade parallel with the contour of the finished pavement.

He took up next the construction of the concrete base, arguing that the improper construction of this is the cause of a large proportion of the failures of brick pavements. In this connection, he called particular attention to the necessity for the proper materials, mixed in the proper proportions, and to the finishing of the foundation parallel with the proposed pavement surface. He also advocated the inclusion of both the concrete foundation and the edging under one specification, and held that the price bid per cubic yard should include both these items, arguing that in this manner a better concrete would be secured for the base.

In regard to the sand cushion, Mr. Acheson expressed his belief that the New York specifications, which call for 1½-in. cushion, provide for the ideal construction. The sand should pass through a ¼-in. screen and be free from pebbles. It sometimes happens, according to Mr. Acheson, that a brick resting on a pebble will rock under traffic, with the result that the brick will break or the bond be destroyed.

In discussing the laying of the brick, Mr. Acheson said that the brick should be carried to the paver in such a way that each one is in such a position for laying that the paver will get the lugs in the same direction and the best face up, this necessitating an intelligent foreman. Bricks, according to Mr. Acheson, should always be laid on their heads. Another point made was the necessity for competent inspectors—who should be engineers. According to Mr. Acheson, the contractor should roll every day all the brick that have been put down and the grouting should also be kept up with the laying, a rainstorm being very detrimental to a pavement which has not been grouted. In conclusion, he urged the necessity for having the brick clean before they are placed in the pavement, stating that it is impossible to secure a proper bond if the bricks are dirty when grouted.

The next speaker was Professor Leonard S. Smith, of the Department of Highway Engineering at the University of Wisconsin. Prof. Smith spoke first of the pavements in Cleveland and Cuyahoga County, Ohio, saying that he had never seen such a fine system of highways around any European city as that leading out of Cleveland. He then took up the matter of the selection of pavements, saying that the reason that Europe has so much finer pavements is not because their engineers know more than ours nor because they take greater pains with their specifications, but largely because the selection of their pavements is left to experts.

The next point made by Prof. Smith was the necessity for maintenance. He said that he had noticed during the past five years a growing sentiment for more efficient road maintenance. He argued that the same authority which directs the construction should direct the maintenance—a principle generally recognized and followed in Europe. He also said that in Europe they start to repair the roads the day after they are built, while too often in America we start to repair ours the day after they are ruined.

Like Mr. Acheson, Professor Smith urged the importance of efficient inspection, recommending that it begin with the raw materials. He expressed the belief that it would be greatly to the advantage of both the manufacturers and the users to have brick inspected at the factory more closely than is sometimes done. At the same time, according to Prof. Smith, in some cases engineers are too particular in regard to inspection. In this connection, he called attention to the desirability of cooperation between the manufacturers, engineers and contractors, and referred to the work which the National Paving Brick Manufacturers' Association has done in this direction. He also referred to the wire-cut-lug brick, saying that its use has greatly added to the life of a properly built pavement. Referring again to European pavements, Professor Smith said that the specifications in use in Europe are not so complete and detailed as American specifications but that, at the same time, better results are secured. The reason for this, he said, is "a certain loyalty which the contractors have toward the work."

Major W. W. Crosby, Consulting Engineer, of Baltimore, Md., followed Professor Smith. Early in his remarks, Major Crosby said that he believed the question of selection to be most important and that he also believed that the use of brick pavements is rapidly increasing. This he ascribed largely to the great increase in traffic during the past few years, and quoted the traffic records in Illinois and Maryland showing how great this has been.

Taking up the discussion of noise, he cited a case in Baltimore in which, as a result of complaints of the noise on a street, the granite block pavement was replaced with sheet asphalt. The street carried a single car track and the area between the rails was paved with brick. Outside of the rail there was a row of liners. After the street was paved there were complaints that the noise was greater than before. Major Crosby said that he investigated the situation and that the noise seemed to come from the space between the rails. He came to the conclusion that the smoother surface of the brick pavement reflected the sound waves exactly as light waves are reflected from a smooth surface; that the sound came down and was thrown back with less loss of volume from the smoother cement filled brick surface than was the case with the rougher stone block pavement. Another factor that might have caused the greater noise, according to Major Crosby, is that a brick pavement is more resonant than a stone pavement. With this in mind, he said that it had occurred to him that something might be done in the way of providing a cushion under the brick which would be of less help in reflecting sound waves.

In discussing the sand cushion, Major Crosby took up the requisite depth, stating the reasons determining the minimum thickness and those for keeping the cushion down to this minimum. He said that it had occurred to him that something might possibly be gained by adding to the sand some of the bituminous materials. He said that he did not know that this matter had been actually tried anywhere but that if it had he would be greatly interested in hearing more about it, adding that he had suggested the idea to Secretary Blair of the National Paving Brick Manufacturers' Association some time ago. It seemed to him, he said, that by this addition of bituminous material it might be possible to still further reduce the thickness of the sand cushion; that possibly a ½-in. cushion of pitch and sand might give as much of a cushion effect as a 1½-in. bed of sand alone, and that it might help in reducing the resonance of the brick pavement, thus decreasing the noise.

W. P. Blair, Secretary of the National Paving Brick Manufacturers' Association, followed Major Crosby. Mr. Blair said that the paving brick manufacturers welcomed suggestions such as that which had just been made by Major Crosby, and said that the suggestion of a bituminous cushion was being tried out. He also called attention to the work done by the organization in devising methods and urging that those which had proved advantageous be applied in the laying of pavements.

M. F. Bramley, President of the Cleveland Trinidad Paving Co., of Cleveland, Ohio, urged the inspection of brick at the factory. He argued that by this plan a considerable saving could be effected in the cartage and laying of brick which would eventually be rejected. Mr. Bramley also referred to the statement made by Professor Smith to the effect that the excellence of European pavements is largely due to the pains taken by the contractors in their work. Mr. Bramley said that human nature is the same everywhere, that the European contractors are like the contractors in the United States but that in this country the contractor, like the engineer, has been gradually set aside by the politician. He said that he didn't believe there was a specification in the United States that gave the contractor any say in the construction, and urged that the contractor be "put in an honest position—in an independent position with certain rights. Then he would take the same interest in building up your road and your pavement that the engineer would had he the same power that he used to have many years ago."

At this point, Mr. Blair called attention to the fact that provision for factory inspection had been made and that more factory inspection could be expected in the future.

The discussion was closed by Mr. Laylin, the author of the paper on brick paving. He said that the Ohio specifications provide for sampling at the factory and that the Highway Department of that state keeps inspectors at different plants.

SURFACES OR FLOORS FOR BRIDGES

By CLIFFORD OLDER

Bridge Engineer, Illinois State Highway Commission

Definite statistics in regard to the number and length of highway bridges for any considerable mileage of highways are difficult to obtain and are not at present available. In some states, however, we are able to ascertain the amount of the total expenditure for bridge work of all kinds. Available information of this kind seems to indicate that approximately one-half of the funds raised for ordinary road and bridge purposes are expended in the renewal and maintenance of bridges.

It is evident, therefore, that if maintenance expenditures are to be reduced to the minimum, highway bridges and bridge floors should receive careful consideration.

Judging from conditions in Illinois, it is probable that at least 90 per cent. of all existing highway bridges are provided with nothing better than plank floors, and that the maintenance of these floors costs approximately 15 per cent. of the total expenditure for road and bridge maintenance, or about $10.00 per mile of road per annum.

Floors for New Bridges.—It is a simple matter to provide strength in the design of a new bridge, to accommodate any of the various modern types of floors or wearing surfaces.

It seems desirable to select a type of floor which will permit the use of a wearing surface of the same kind as that on the adjacent highway, so that the same method of maintenance may be used on the bridge floor as elsewhere.

The difference in weight of various types of floors has but little effect on the design and cost of concrete bridges. Steel bridges, however, are materially affected in both design and cost, by a comparatively small variation in the weight of the floor.

The saving in the weight and cost of the steel in the trusses and floor system for the lighter floors may outweigh the advantage of having the same wearing surface on the bridge as elsewhere on the highway.

Floors for steel bridges only will be considered in this discussion.

It is desirable to provide an independent wearing surface so that although the pavement may be worn practically through, the bridge may still carry traffic with safety.

The bridge floor should then preferably consist of two elements.

The sub-floor, which should be as permanent as the bridge superstructure and should provide the necessary strength to transmit the highway loads to the floor supports, and a wearing surface of such character as to permit of economical maintenance.

In considering construction materials for both these elements, the matter of weight increases in importance with the length of span.

For sub-floors of the more permanent type, buckle plates with concrete covering, reinforced concrete, and creosoted plank cover the field.

For wearing surfaces, brick, concrete, creosoted blocks, macadam, gravel, mixtures of bituminous materials with sand, gravel or stone, plank, ordinary soil and practically all other varieties of surfacing materials have been used.

In comparing costs, it is necessary to consider not only the cost of the floor and its maintenance, but also the effect of the weight of floor selected on the design and cost of the remainder of the bridge.

Classification of Floors With Respect to Weight.—For the purpose of considering the effect of the weight of the floor on the design of the superstructure, the various types of floors are herein grouped in four classes.

Class A Floors: Floors which weigh approximately 100 lbs. per sq. ft. of roadway surface are included in Class A. Floors consisting of a reinforced concrete sub-floor, assumed to weigh 50 lbs. per square ft., on which is placed a wearing surface of concrete, brick, macadam or gravel, are of this class. The wearing surface is assumed also to weigh 50 lbs. per sq. ft. of roadway surface.

Class B Floors: Floors which weigh approximately 65 lbs. per sq. ft. of roadway surface are included in Class B. Floors consisting of a concrete sub-floor, with a creosoted block wearing surface and floors consisting of creosoted plank sub-floors with a brick wearing surface, are of this class.

Class C Floors: Floors which weigh approximately 32 lbs. per sq. ft. are included in Class C. Floors consisting of a creosoted plank sub-floor with a creosoted block wearing surface, are included in this class.

Class D Floors: Floors which weigh approximately 26 lbs. per sq. ft. are included in Class D. Floors consisting of a creosoted plank sub-floor with a wearing surface about ¾ in. thick, composed of a mixture of gravel and bituminous material, are of this class.

Buckle plate floors are not considered, as they weigh as much and cost more than concrete sub-floors.

Description of Floors Illustrated.—Figure 1 shows standard designs used by the Illinois Highway Department for the floors above mentioned.

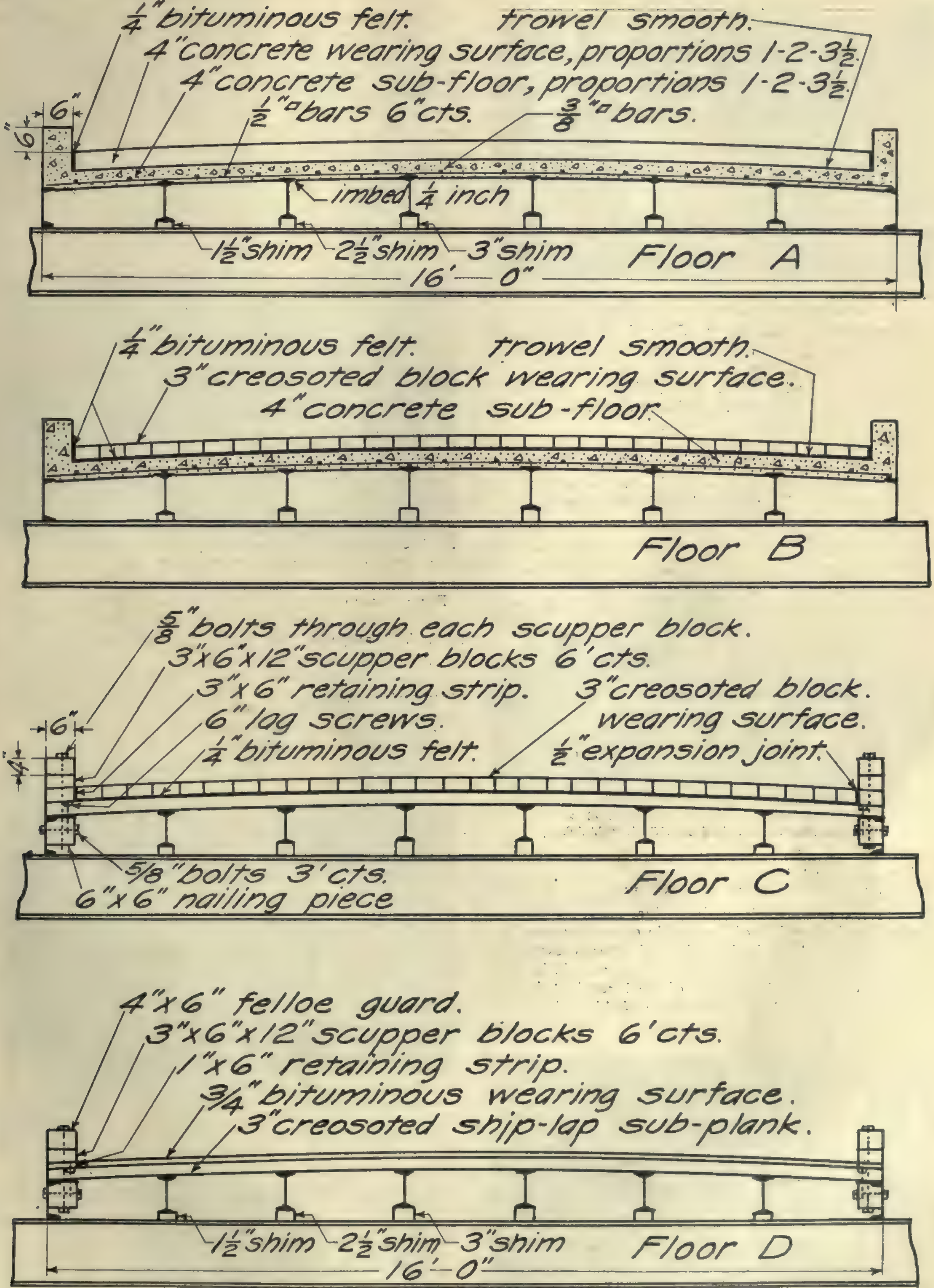


FIGURE 1.—STANDARD DESIGNS OF THE ILLINOIS STATE HIGHWAY DEPARTMENT FOR BRIDGE FLOORS OF CLASSES A, B, C AND D.
(SEE TEXT ON OPPOSITE PAGE).

CONCRETE SUB-FLOOR READY FOR THE WEARING SURFACE—ILLINOIS HIGHWAY BRIDGE.

The creosoted plank sub-floors (Floor C and Floor D) are crowned by bending the plank over the stringers and anchoring the ends to the nailers by means of lag screws.

The creosoted blocks (Floor B and Floor C) are laid on a ¼-in. bituminous felt cushion, which is coated with asphalt immediately before laying the blocks.

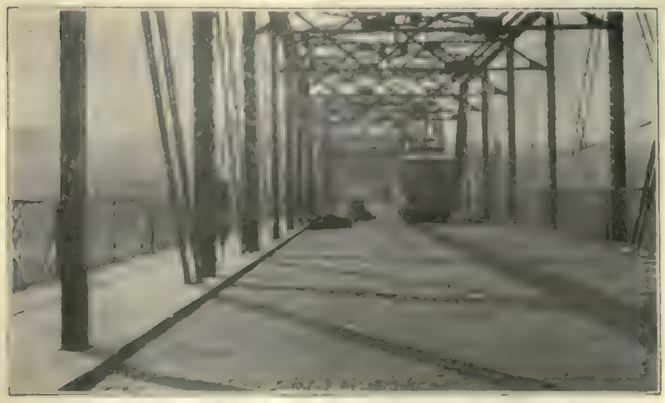
Ship-lap sub-plank are used for floors having a bituminous gravel wearing surface. The use of this form of sub-plank has been found to be the cheapest and most effective method of preventing the leakage of the bituminous material.

HIGHWAY BRIDGE IN ILLINOIS—CONCRETE SUB-FLOOR WITH MACADAM WEARING SURFACE.

The five illustrations on this page show some of these floors on existing bridges.

Explanation of Curves.—The curves (Figure 2) show the weight of the structural steel in bridge superstructures as a percentage of the weight of the steel in superstructures having Class A floors. That is, the weight of superstructure steel in bridges having floors weighing 100 lbs. per sq. ft. is taken as 100 per cent. and the weight of steel required for the lighter floors expressed as a percentage of this weight.

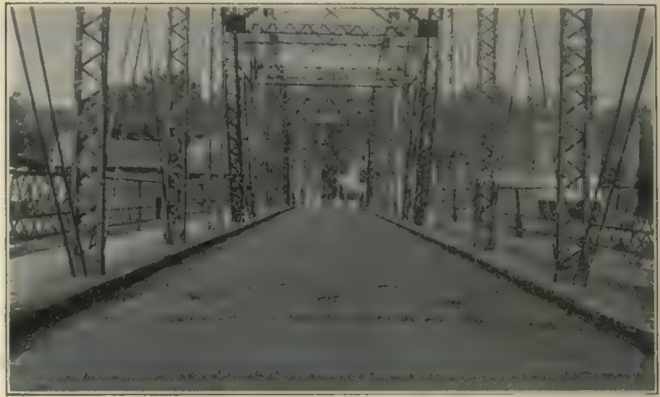
These curves are based on the weight of steel in spans which conform to the standard designs of the Illinois Highway Department. The designs used provide for 16-ft. roadways. The curves were checked at a number of points, however, for 18-ft. roadway designs and were found to conform very closely. These curves are sufficiently accurate to enable a designer to determine the relative cost of steel superstructures having floors of various types and weights.



AN ILLINOIS HIGHWAY BRIDGE WITH A CREOSOTED PLANK SUB-FLOOR AND A BRICK PAVEMENT.

The curve (Figure 3) is based on the curves (Figure 2) and shows the average per cent. variation in weight of steel for a variation of 10 lbs. per sq. ft. in the weight of the floor.

Figure 4 shows the average contract price for the Illinois Highway Department standard 16-ft. roadway steel spans with floor complete.



AN ILLINOIS HIGHWAY BRIDGE WITH CREOSOTED PLANK SUB-FLOOR, READY FOR WEARING SURFACE.

For spans up to 80 ft. inclusive, riveted pony trusses are used. For spans from 90 to 160 ft. riveted Pratt trusses are used. This range of span length covers at least 90 per cent. of the highway bridges in Illinois.

The average contract price of materials is as follows:

Structural steel, complete in place	$.03½ per lb.
Concrete sub-floors, including reinforcing steel	$12.00 per cu. yd.
Concrete wearing surface, 4 ins. thick	$0.90 per sq. yd
Creosoted sub-plank (12-lb. treatment) complete in place, $70 per thousand feet, board measure.	
Creosoted block wearing surface	$1.80 per sq. yd.
Bituminous gravel wearing surface	$0.60 per sq. yd.

BRIDGE SHOWN IN ILLUSTRATION ABOVE, WITH BITUMINOUS GRAVEL WEARING SURFACE IN PLACE.

The average cost of sub-floor and wearing surface per foot of 16-ft. wide roadway (1.78 sq. yds. including curbs) is as follows:

Concrete sub-floor with concrete wearing surface (wt. 100 lbs. per sq. ft.)	$4.25 per ft. of bridge
Concrete sub-floor with creosoted block wearing surface (wt. 65 lbs. per sq. ft.)	5.80 per ft. of bridge
Creosoted plank sub-floor with creosoted block wearing surface (wt. 32 lbs. per sq. ft.)	7.30 per ft. of bridge
Creosoted plank sub-floor with bituminous gravel wearing surface (wt. 26 lbs. per sq. ft.)	5.15 per ft. of bridge

It seems probable that under average conditions the length of life of the floors represented by the upper three full-line curves may equal that of the remainder of the superstructure and that the cost of maintenance for this period would be small.

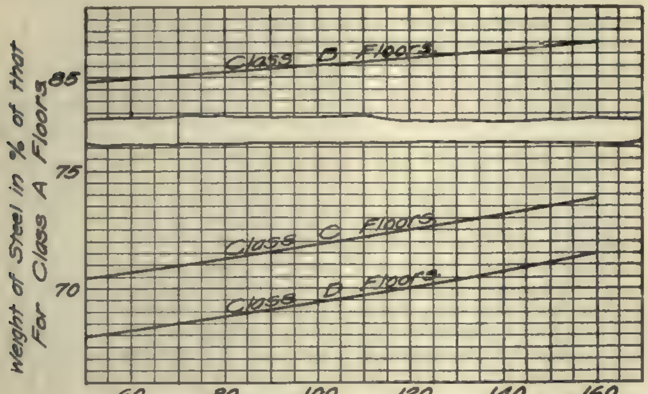


FIGURE 2.

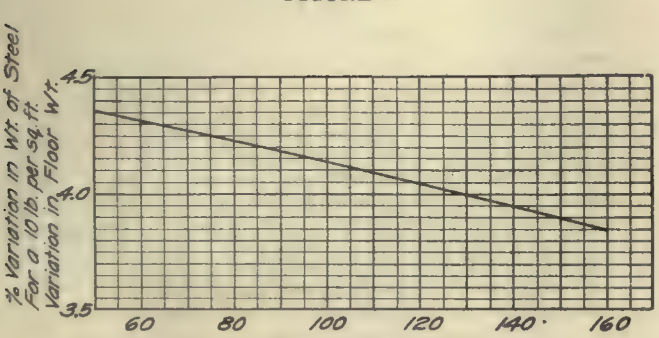


FIGURE 3.

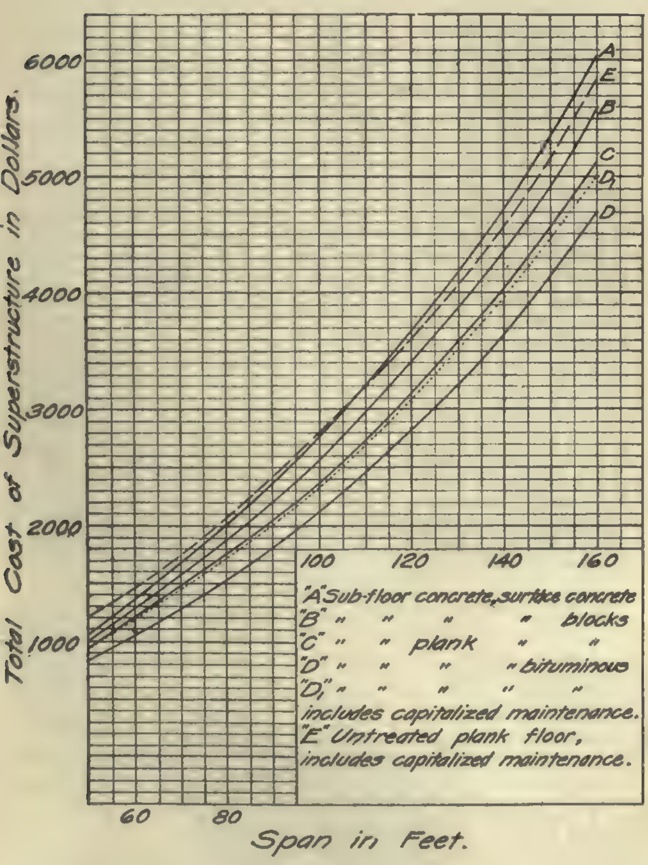


FIGURE 4.

The experience of the Illinois Highway Department seems to indicate that under average conditions, the bituminous wearing surface requires a light treatment of oil and stone chips or screened gravel, at intervals of about four years at a cost of about 10 cts. per sq. yd. and a probable complete resurfacing once in about twelve years at a cost of approximately 60 cts. per sq. yd. This amounts to 7½ cts. per sq. yd. per annum. Adding to the first cost of the bridge, the maintenance charge capitalized at 6 per cent., Curve D_1, Figure 4, results. The position of this curve indicates that it would be preferable to use creosoted block or other floor in building new structures.

Probably 95 per cent. of existing steel highway bridges were originally designed for ordinary plank floors. Under average conditions and at the present price of yellow pine, which is the material now quite generally used, the annual cost of maintaining such floors is about 35 cts. per sq. yd. The first cost, plus the maintenance charge capitalized at 6 per cent., results in Curve E, Figure 4.

Conclusion.—It is evident that ordinary plank floors having an average life of not more than three and one-half years are to be avoided when possible.

It is to be noted that with the exception of the floor with the bituminous surface, the cost of the floor increases as the weight decreases, and yet the cost of the entire superstructure decreases as the weight of floor decreases.

The saving in cost for the lighter floors increases with an increase in the unit cost of structural steel in place, and decreases with an increase in the cost of the materials used in such floors.

In reflooring old steel bridges of satisfactory design, a creosoted sub-plank with bituminous wearing surface has been found to give reasonable service. The weight is somewhat greater than that of a plank floor, but the effect of the added weight is probably offset by the reduction of impact, due to the comparatively smooth and yielding surface.

The cost of maintaining the bituminous surface is only about 20 per cent. of that of an ordinary plank floor.

There seems to be no place in the economic design of new highway bridges for floors consisting of a creosoted plank sub-floor with a brick wearing surface as the life of such a floor could hardly be greater than that of floor C, Figure 1, while the cost of the complete superstructure would be greater than that represented by Curves B and C, Figure 4.

The floors listed under Class A seem hardly to be justifiable, except for short spans, unless other considerations outweigh first cost.

Summary of Discussion

John R. Chamberlin, Deputy in Charge of Bridges, Ohio State Highway Department, was the first speaker to discuss Mr. Older's paper. He said that there could be no question but that the bridge floor problem is of sufficient magnitude to justify more attention than it ordinarily receives, and quoted figures to show the cost of maintaining bridge floors in Ohio.

He said that while Mr. Older mentioned the desirability of using on bridges wearing surfaces the same as those on adjacent roadways, so that the same methods of maintenance could be used, his figures for the cost of steel bridges showed a balance in favor of other types of floors. This balance, he said, must be compared with other advantages gained by using a bridge carrying a pavement similar to that on the adjacent roadway. Other conditions than the convenience of maintenance in favor of a concrete sub-floor carrying road metal as compared with a plank floor carrying wood block were cited by Mr. Chamberlin as follows: First, its rigidity; second, its weight or inertia; third, its tendency to absorb impact; fourth, its greater efficiency in distributing concentrated loads, and, fifth, its continuity with the roadway.

Because of its rigidity, he said, a bridge is less racked by a moving load—that is, there are lesser secondary stresses in riveted trusses and less vibration due to the movement of the load. He also argued that a concrete sub-floor is a valuable adjunct in resisting wind stresses and similar stresses due to high water with accompanying floating drift, and in short spans it affords ample lateral bracing without a special lateral system. Because of its weight, according to Mr. Chamberlin, the reversal of stresses is reduced in amount; the bridge is less liable to be dislodged by high water, and, if the usual unit of stress of 16,000 lbs. is used in the design, the large ratio of dead load to total load gives an additional factor to safety. He also pointed out that with the increasing of the dead load the effect of impact becomes less. In regard to the greater efficiency of the concrete sub-floor carrying road metal as compared with a plank floor carrying wood block, Mr. Chamberlin pointed out that the design of a joist is generally governed by a concentrated load; that the portion of this load carried by each joist depends upon the flexibility of the sub-floor, and that, therefore, since planks are more flexible than a concrete slab, individual joists must be proportioned to receive a larger live load—in other words, the same joists may be spaced farther apart with a concrete slab than with plank. In regard to continuity with the roadway, he stated that it is a matter of common observation that a depression is formed at each end of a bridge by the passage of wheels from one kind of surfacing to another. This difficulty practically disappears if the pavement is continuous.

Mr. Chamberlin then took up the matter of cost of Types A and C in Fig. 4 of Mr. Older's paper, presenting a similar comparison based on plans of the Ohio State Highway Department. The points made by this comparison were that Type A is cheaper up to and including the 120-ft. span; second, that the difference in cost is much greater at 140 ft. than at any of the other three lengths, and, third, that while the dead load is greater in Class A there is actually less structural steel required than in Class C.

Mr. Chamberlin called attention to the fact that in Fig. 1 of Mr. Older's paper Floor A is shown with a concrete sub-floor and a concrete wearing surface, each 4 ins. in thickness, and that it is provided that the first course be troweled smooth before the second is applied. He raised the question as to whether troweling smooth is sufficient. He said that the idea of the separation of courses is ignored by some who contend that when a concrete wearing surface is laid it should be permanent, and he pointed out that the wear on a concrete floor used also as a wearing surface is very considerable.

Mr. Chamberlin was followed by Edward A. Byrne, Assistant Chief Engineer of the Department of Bridges, New York City, who reviewed at some length the practice of the Bridge Department of the City of New York on the four bridges over East River—the Queensborough, Williamsburgh, Brooklyn and Manhattan Bridges. Taking up each of these separately, Mr. Byrne described the construction of the floor and the experience of the department in maintenance. Mr. Bryne also referred to other bridges under the jurisdiction of the department.

In conclusion, he stated that in the design of new bridges when weight is the factor wood block on a timber base is the most satisfactory pavement that can be used and that where conditions permit of a heavier material granite block is the most desirable. He also suggested a specification for the construction of bridge floors where the design calls for a wood block pavement on a timber sub-floor.

BITUMINOUS CONSTRUCTION AND MAINTENANCE —RECENT PRACTICE

By WILLIAM D. UHLER

Principal Assistant Engineer, Bureau of Highways and Street Cleaning, Philadelphia, Pa.

The discussion of this subject is intended to outline the main features of construction and maintenance of bituminous pavements in the city of Philadelphia, to describe the method of carrying out the specifications and to call attention particularly to the conditions confronting us in present-day bituminous construction, which must be overcome to secure the desired results.

Many perplexing problems arise in the construction of bituminous pavements, especially on streets occupied by railway tracks, where many failures occur alongside and between the rails, due, in most cities, to old agreements, contracts, etc., which prevent the authorities from compelling the railway companies to reconstruct their tracks in accordance with present-day standards. For instance, in Philadelphia, with few exceptions, practically all of the trolley tracks are ballasted with the natural soil, which is a sandy loam. This not being a rigid construction, there is more or less movement of the rails which damages the pavement. The ideal construction, from the standpoint of the paving, is to place concrete under the ties, and it is usually found advisable, as well as more economical, to place runners of at least one row of blocks on either side of the rails to take the shock and extra wear caused by heavy traffic turning on and off the tracks. There is a difference of opinion among engineers as to the character of blocks best suited for this purpose—scoria, vitrified, wood and granite blocks are used largely—but experience indicates that the most satisfactory results are obtained from the use of closely fitted granite block runners, bedded in the green concrete, and well grouted.

Philadelphia's specifications for sheet asphalt are substantially the same as those adopted by the Association for Standardizing Paving Specifications, at Pittsburgh, in 1913. The country road bituminous specifications include the so-called patented pavements—Amiesite, Filbertine and Warrenite—and a bituminous concrete somewhat similar to the Topeka mixture. Each bidder can bid on only one type of pavement, and the work is awarded to the lowest bidder, irrespective of the type bid on, the pavements being in competition with one another.

The following are abstracts from these specifications, which show the mineral aggregate and the percentage of bitumen used in each pavement.

Amiesite

The mineral aggregate shall be clean, crushed trap rock of approved quality, the maximum to pass a 1½-in. ring, and so graded as to produce the densest mixture. The mineral aggregate shall be treated with a liquefier to make the asphalt adhere. The asphalt, heated to about 275° F., shall then be added, and after the mineral aggregate is thoroughly coated, oxide of lime shall be added. The ingredients referred to above shall be mixed by weight in the following proportions:

Mineral aggregate	92 per cent.
Asphalt	5 per cent.
Lime	1½ per cent.
Liquefier	1½ per cent.

Filbertine

The mineral aggregate in the Filbertine mixture shall be within the following proportions best suited to make the densest mixture:

¾-in. stone, hard crushed	55 to 65 per cent.
Sand, coarse to fine	35 to 45 per cent.
Mineral dust	4 to 6 per cent.
Asphalt cement	6 to 8 per cent.

Warrenite

The stone, with or without the addition of sand, graded in the following proportions so as to give the wearing surface the greatest degree of density, rigidity, inherent stability and freedom from voids:

Material passing 1¼-in. screen and retained on a No. 8 sieve	40 to 60 per cent.
Material passing No. 3 sieve and retained on a No. 4 sieve	10 to 20 per cent.
Material passing No. 4 sieve and retained on a No. 10 sieve	10 to 5 per cent.
Material passing a No. 10 sieve and retained on a No. 30 sieve	10 to 5 per cent.
Material passing a No. 80 sieve, at least 25% of which will pass a No. 200 sieve	10 to 5 per cent.

The balance to pass a No. 30 sieve and be retained on a No. 80 sieve.

From 5 to 10 per cent. of Warrenite cement as directed sufficient in quantity to coat each particle and fill the voids remaining between the stones.

Bituminous Concrete Specification

The finished pavement shall contain between 8 per cent. and 9 per cent. of bitumen, depending upon its composition, but in all cases, sufficient asphaltic cement shall be used to thoroughly coat all the particles of the mineral aggregate. Fine mineral aggregate shall be proportioned by weight as follows:

Portland cement or stone dust passing No. 200 sieve	0 to 15 per cent.
Sand, passing No. 80 sieve	18 to 36 per cent.
Sand, passing No. 40 sieve	20 to 40 per cent.
Sand, passing No. 10 sieve	8 to 25 per cent.
Sand, passing No. 4 sieve	Up to 10 per cent.

With this fine graded aggregate, there shall be used a proportion of clean, hard limestone with a coefficient of wear of not less than 10, or trap rock chips with a coefficient of wear of not less than 15, all of which will pass a ½-in. screen and be retained on a No. 10 screen, amounting to approximately 25 per cent. of the whole aggregate.

It might be well, in this connection, to state that paving authorities, when admitting in competition any of the proprietary or patented pavements, should insist upon a full and complete specification for each of the types in question, so that when a pavement is laid the engineer will have sufficient knowledge of the materials comprising the pavement to enable him to control its construction. No pavement of any character is laid in the city of Philadelphia unless information is furnished: First, as to the quality and properties of the material to be used; second, the preparation of the mixture at the plant; and, third, the proposed method of laying the mixture on the prepared foundation.

In the preparation of the mixture all materials are subjected to rigid plant and laboratory inspection. During the actual operation, inspectors with engineering education or training are assigned to each asphalt plant, to inspect, in so far as can be done at the plant, the raw materials as to quality and mechanical grading of the sand, crushed stone and mineral filler or stone dust, and daily samples representative of the materials used and mixtures made at the plant are sent to the central laboratory where they are tested and the results filed as a permanent record of the pavements laid.

The specifications stipulate the penetration of bitumen and temperature within limits sufficiently wide to cover all conditions, but definite instructions covering these two points and based on the amount and character of traffic are given to the inspector for each contract.

The foundation having been laid to true line and grade, the next step is to obtain a correct and uniform depth of binder and wearing surface, raked to a true cross section and grade, after which it must be thoroughly rolled; and without doubt the most important single point in the laying of bituminous wearing surfaces is the question of rolling. More pavements are failing today through displacement from their original from than from all other causes combined, and aside from the other reasons to which this result may be attributed (and there are undoubtedly many) it is certain that unless a pavement is free from waves at the time of its completion it never will be, as the tendency of the pavement is to push under traffic, which increases the wavy condition. It is important, therefore, that all pavements be thoroughly compressed, carefully rolled and cross-rolled, with properly maintained rollers operated by skilled roller engineers. It has been the practice in some cities to use only one roller, but far better results can be obtained by using a light roller for the initial compression and a heavier roller for the final compression. The best results obtained in Philadelphia have been by an equal amount of transverse and longitudinal rolling with a 2½-ton roller, followed by an equal amount of transverse, longitudinal and diagonal rolling with an 8 or 10-ton roller.

In the laying of sheet asphalt or bituminous concrete, where brick gutters are used and adjacent to block runners along car tracks, it is good practice to lay the finished surface of the pavement from ⅛ to ¼ in. higher than the brick gutters or runners. It is difficult in the rolling to secure final compression next to these blocks, and traffic will further compress that portion of the pavement, naturally causing the development of low spots which hold water and result in deterioration.

It is questionable whether, as compared with the old so-called open binder, the latest specification for the binder course which calls for a grading of stone from 1 in. diameter down, with the addition of 25 to 35 per cent. of sand, producing a mixture with greatly reduced voids, does not result in giving a decreased mechanical bond for the wearing surface, and whether, in view of the possibility of the top shifting under traffic, it might not be advisable to use the open binder exclusively.

In the grading of the mineral aggregate, special attention must be paid to the percentage and penetration of the asphaltic cement which, of course, is dependent upon the asphalt used, climatic and temperature conditions, and the character and amount of traffic.

The following is the present practice in Philadelphia under average conditions:

Philadelphia Surface Mixtures, 1914

Traffic conditions:	Light.	Medium.	Heavy.	Patching.
Per cent. bitumen	10½	10½	10¾-11.0	10¼
Penetration:				
Mexican	60–65	50–60	45–50	50–55
California	60–65	50–60	45–50	50–55
Bermudez	60-65	50-60	45-50	50-55
Trinidad	55–60	45–55	40–45	45–50

Note—Bitumen figures varied slightly from the above to take care of unusually fine or coarse sand.

Bituminous Macadam, Penetration Method

In penetration work, after the base has been prepared, and clean, approved hard stone has been spread to the required depth, the recognized practice is to use from 1¼ to 1½ gals. per sq. yd. of bituminous material conforming to the specifications. Then, after chipping and rolling, a flush coat or seal coat is applied of from ¼ to ½ gal. per sq. yd. and another application of chips, before the final rolling.

The tendency has been to discontinue this method of construction, where it is practicable to use the mixing method. Although it is an admitted fact that the penetration method is slightly cheaper than bituminous concrete in first cost, when the life and maintenance of the respective pavements are taken into consideration it is doubtful whether the penetration method is not more costly than the mixing method.

There probably has been more deterioration in roads built by the penetration method than in any other modern type of construction. Generally speaking, this is due to too much personal equation entering into the work, as, for instance, unequal distribution of binder, resulting in the formation of waves and ruts which always grow worse under traffic. The method of heating the binder is not as easily controlled as in a mixing plant and often results in overheating, causing weak spots in the pavement. Even if the method of construction were more ideal, it is questionable whether the penetration method should be used, as at the present time there are on the market a number of portable mixing plants of all sizes that would be practicable in most sections of the country, and it is generally conceded that the mixing method is preferable to the penetration, provided first cost is not the dominating factor.

Bituminous Pavement, Mixing Method

The specifications in the city of Philadelphia are as definite and rigid in their stipulations covering the preparation and laying of bituminous concrete pavements as they are in the case of sheet asphalt. All these pavements are now being laid on a 4-in. concrete base instead of on an existing macadam foundation, which heretofore has been the generally accepted practice on country roads. In view of the increased amount and change in character of the traffic, even though slightly more expensive, it has been considered advisable to provide for a 4-in. concrete base on top of the broken stone or telford base, due to the tendency of the macadam base to shift or further consolidate under traffic and possible subgrade trouble, all of which tend to bring about a wavy or uneven surface.

In resurfacing old water bound macadam roads, where the road consists of either telford or macadam base, the broken stone surface is removed to a depth sufficient to conform to the required cross section and grade. Where the telford surface is exposed, the irregularities are broken off with a napping hammer and the depressions filled in, and upon this prepared surface is placed a 4-in. concrete base, mixed in the proportions of 1:3:6, so laid as to secure a very rough but regular surface to form a bond between the concrete base and the bituminous top. In conjunction with the concrete base a concrete header curb is constructed extending 6 ins. beyond the fixed edges of the bituminous pavement and to the finished grade. After the concrete base has developed a hard set, and from one to two days prior to the placing of the bituminous wearing surface, the base is thoroughly cleaned of loose and foreign material, by sweeping, and is then covered with an asphaltic cut-back mixture consisting of equal parts by volume* of asphaltic cement, 55 to 65 penetration, and commercial naphtha, 52 to 55 gravity; the mixture being applied by a pressure distributor at the rate of ⅛ gal. per sq. yd. The object of this paint coat is to secure a better bond between the concrete base and the bituminous top. The bituminous top, 2 ins. in thickness, is laid under the same requirement as to preparation, laying, rolling and inspection as for sheet asphalt. Where a new pavement is laid on the earth subgrade, a 5-in. concrete foundation is used.

One of the important features in connection with obtaining the best results in bituminous concrete construction is the use of good, hard, durable stone, free from dirt and decomposed material, in the wearing surface, as decomposed stone in the mixture will naturally develop weak spots in the pavement, ultimately resulting in failure.

The following penetrations are used in Philadelphia:

	Heavy Team or Motor Traffic.	Medium or Light Traffic.
Trinidad Asphalt	45-50 penetration	50-55 penetration
Bermudez, Mexican and California	50-55 "	55-60 "

There always has been a tendency to slight or overlook details in this class of work, and, as an illustration, the following is quoted from the fourth annual report of the Association for Standardizing Paving Specifications, 1913:

> In the case of a park driveway or a suburban highway, a bituminous concrete pavement may be successfully used without a curb; no other protection for the edge of the pavement is required except to provide a coarse, grainy surface into which the paving material is rolled.

There is no question but that this was the generally accepted practice at the time this report was made. Later experience, however, has demonstrated that this method of construction might answer for wide roads with light traffic, but where the width of the paved surface is 18 ft. or less the turning of traffic on and off the bituminous surface will result in grinding or cracking the edges and also, unless a perfect bond has been secured with the base—and this cannot be relied upon—heavy wheel loads, at a distance of 1 ft. to 2 ft. from the edge, will produce a spreading of the bituminous surface. To obviate this, provision is made in the Philadelphia country road specifications for a 6-in. concrete header curb on either side of the road where the road is not paved to the full width.

The idea that the introduction of stone into the bituminous mixture is a cure for all the troubles which have developed in recent years with sheet asphalt is wrong. Topeka and later specifications developed from it, calling for about 25 per cent. of ½-in. stone, cannot be considered ideal bituminous pavement, as the stone is not sufficient in quantity or size to produce the interlocking required for stability in the mineral aggregate. In laying this type of pavement the segregation of the mixture in pockets of fine and coarse material will produce a pavement with irregular wearing qualities, unequal compression and unequal ability to resist displacement by traffic; with the use of stone in larger quantities a much more stable pavement is secured, but an element of danger is introduced with the use of large stone, in the mixing and laying, brought about by the segregation of the large and small sizes of stone, with the result that the pavement will not be as uniform in character as is the case with a standard sheet asphalt pavement.

Maintenance of Bituminous Pavements

We all know that the success of any pavement depends on the maintenance, and the success of maintenance depends largely on attention to details, for instance, in cutting out the old material and cleaning the base, placing the new material, rolling, etc. Judgment and experience are necessary in determining the extent of the work to be done and the amount of material to be cut out for each individual patch. A patrol maintenance system will do more to preserve roads and pavements and prevent deterioration than any one thing.

There are two methods that can be considered for the maintenance of bituminous pavements by contract: first, by the square yard; and, second, on the tonnage basis. Working on the square yard basis, there is more or less of an element of chance taken by the contractor as to the depth of binder and top to be laid, due to the age and unequal wear of the pavement, and as the binder is naturally the cheaper the contractor is apt to increase the depth of the binder and decrease the depth of the top. On the tonnage basis due to the fact that the price bid for the binder is usually about one-half that for the top, there is a tendency on the part of the contractor, unless the work is closely inspected, to cut down on the amount of binder and to increase the amount of top. Thus in the two methods the case is reversed. On the tonnage basis, however, since payment is made only for the actual amount of binder and top used, there is really no "gamble" on the part of the municipality or the contractor as to the amount of each class of material to be furnished, which is the case on the square yard basis. It is, however, more desirable for the city to own an asphalt plant as this class of work can be handled more satisfactorily by municipal forces than by the contract system.

In order to assist in solving many of the perplexing problems arising in connection with paving work, it has been found advisable to build experimental and service test roads. If this practice had been consistently followed, the result would be that we would not have the extensive failures we have had through the use of untried materials and methods of construction, which should have been tried out experimentally on a small scale, such as was done in Maryland on Park Heights Ave., built in 1910; and the White Plains experimental road, Borough of the Bronx, New York, built in 1910. A service test roadway such as built in Philadelphia in 1912-13; and Second Ave., New York, built in 1912, which comprise more or less standard methods of construction and materials, should be of great value in compiling permanent records of the comparative value of the different types of the present-day standard pavements. Work of this kind should be encouraged as it will ultimately result in solving many of our paving problems. Detailed information relative to Park Heights Ave., White Plains Road and the service test roadway has been published in report form and distributed to the public, but, up to the present time, no information has been available with reference to the Second Ave. work. It is hoped, however, that this data will be made public in the near future.

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*"Equal parts by volume" may be said to be 58 to 60 per cent. by weight of asphalt and 42 to 40 per cent. by weight of naphtha.

If we are to arrive at any solution of our troubles, it behooves all of us to be frank, and, instead of coming to the various road conventions and telling of the successes, we must come to the front and tell of the failures, as it is an indisputable fact that every state or municipal officer here today has and is having his failures. This being the case, why not give the "other fellow" the benefit of your experience? If this thought were carried out there would be less failures.

Summary of Discussion

R. A. Meeker, State Highway Engineer of New Jersey, was the first speaker to discuss Mr. Uhler's paper. He said that Mr. Uhler had wisely placed at the head of perplexities that of the intrusion of street railway tracks into the pavement, and expressed his approval of Mr. Uhler's suggestion that concrete be placed under the ties. The movement of the rails, according to Mr. Meeker, will ruin any pavement adjacent to them and, therefore, the interposition of some form of block pavement is necessary. Mr. Meeker said that while Mr. Uhler had suggested one row of blocks at the sides of the rails he would add to this single row a double row at every rail joint—first, to facilitate the work of repairing the joints; second, to overcome the disturbance of the pavement during such repair, and, third, to discourage the practice of driving along the rail.

Mr. Meeker then took up the grading of the mineral aggregate in bituminous pavements and cited the New Jersey specifications. In regard to the amount of bitumen used, Mr. Meeker said that the percentage used in New Jersey work varied from 6 to 8 instead of from 8 to 11 as was given by Mr. Uhler; that when the quantity exceeded 8 per cent. trouble was experienced with waves and ridges in the pavement and also with bleeding, and that, on the other hand, if the percentage fell below 6 the pavement was apt to check or crack.

Mr. Meeker also agreed with Mr. Uhler as to the importance of rolling and as to many of the other details of construction advocated by the author of the paper.

The next discussion of Mr. Uhler's paper was written by E. A. Kanst, Superintendent of Lincoln Park, Chicago, Ill., and read by George T. Donoghue, Chief Engineer of the Board of Lincoln Park Commissioners.

According to Mr. Kanst, the choice of blocks to be used adjacent to street car rails lies between granite and creosoted blocks, the former being preferable on ordinary streets and the latter on boulevards. In referring to the rolling of bituminous pavements, he stated that when such a pavement is laid on a concrete base the ultimate success of the pavement is, in a large measure, in the roller-man's hands and where the foundation is of macadam the roller-man's responsibility is doubled. He also expressed the belief that in rolling the tendency is to stay too far away from the curbs and rely almost entirely on hand tamping for the compaction of the part of the pavement near the curbs. He said that in the Lincoln Park work hand tamping is being done away with as much as possible and every effort is being made to get the compression near the curbs from the roller.

The penetration method of construction has been practically abandoned in work in Lincoln Park, according to Mr. Kanst, for everything except patching, lack of uniformity in results being one of the principal reasons for abandoning this type of construction. Referring to Mr. Uhler's account of the laying of a 4-inch concrete base on top of broken stone or telford, Mr. Kanst questioned whether or not it would have been just as satisfactory and probably more economical to lay the bituminous wearing surface directly upon the old macadam base, suggesting that the money saved by the omission of the concrete might well be applied to the future maintenance of the road. In regard to the use of curbs on park driveways, he said that he could see no objection to an inconspicuous curb; that without curbs the dividing lines between parkways and driveways are usually left to the imagination and that if an attempt is made to define the line by keeping the sod cut the cost is generally enough to pay for several curbs. In closing, he expressed himself as heartily in accord with Mr. Uhler's opinions on maintenance.

Philip W. Henry, Consulting Engineer, New York, N. Y., who was scheduled to take part in the discussion on Mr. Uhler's paper, was not present but sent in a written discussion, which was read only by title. In general, he agreed with Mr. Uhler's paper, laying special emphasis upon the subject of the penetration method, the use of concrete foundations, the introduction of large stones into the aggregate and the effect of the close binder. In discussing the penetration method, Mr. Henry stated that the mixing method is much more certain in guaranteeing definite proportions of mineral aggregate and bituminous cement, and a uniform mixture. He expressed the belief that the penetration method should be used only on roadways carrying very light traffic. In reference to the use of a Portland cement concrete foundation on a subgrade of old macadam, Mr. Henry expressed the belief that where there remains a minimum of five inches of macadam or telford which has been thoroughly consolidated by traffic, that in itself should be sufficient foundation on a road carrying ordinary traffic.

In closing, Mr. Henry referred to the re-use of bituminous surface mixtures. He reviewed the attempts which have been made at various times to utilize these mixtures in new work, and said that while it is mechanically possible to recover the mineral aggregate and the bitumen separately so that they can both be used again it has been demonstrated that such recovery can not be made on a basis that will compete with the use of new materials. He expressed the belief that it is quite possible that this will yet be brought about.

R. Keith Compton, Chairman of the Paving Commission of Baltimore, Md., was the last speaker in the discussion of Mr. Uhler's paper. The first point taken up by Mr. Compton was the use of concrete under the ties of street railway tracks. He reviewed in some detail the work of that nature in Baltimore and said that the placing of concrete as a foundation for street railway tracks in that city has proved a very satisfactory solution of the troubles which have been experienced. He said that in that city it has been so placed as to maintain car service, and described the method followed. He then took up the matter of inspection, emphasizing the importance of inspection at the plant, at the laboratory and on the street, and outlined the methods followed in Baltimore. He also called attention to the necessity for thorough rolling, quoting the Baltimore specifications.

In discussing bituminous concrete, Mr. Compton said that in the city of Baltimore about 10 miles of this type of pavement has been laid with varying degrees of success. In some cases there had been a tendency for the wearing surface to creep, especially under heavy slow-moving traffic, and on all examinations of these cases the presence of dampness on the top of the concrete has been noted. This, he said, proved conclusively to him that a paint coat is absolutely necessary under all bituminous pavements. The maintenance problem, according to Mr. Compton, can be satisfactorily solved only by every city owning a municipal asphalt plant.

CONCRETE ROADS

By H. J. KUELLING
County Highway Commissioner of Milwaukee County, Wisconsin

The subject that has been assigned to me is "Concrete Roads" and I will therefore limit my remarks to the subject in question and not refer to the subject of "Concrete Pavements," which, I believe, has some quite different problems.

While there are several isolated cases of concrete roads that are fairly old, the pavement is a type that is quite recent and has had a phenomenal growth within the last five years. Naturally, with such a growth there have come about changes in the opinions of engineers relative to the best practices. Without a doubt, there will be many great changes before the standards are unified and many of the things we are now doing will be looked back upon as rather poor engineering.

Because of these rapidly changing conditions, the remarks I am about to make will be points of serious discussion and many of my opinions will, no doubt, be disproven within the course of a few years if they are not disproven almost immediately.

Roadbed.—As in all forms of road construction, the roadbed for a concrete road is almost as important as the wearing surface itself. However, because of the rigid nature of the pavement, I believe that the roadbed can be of poorer quality for this form of road construction than that in any other form that I know of. This does not mean that I recommend the neglecting of proper preparation of the roadbed; but as engineers know, in preparing a road in very dry weather, springy or spongy places are sometimes overlooked and in the cases of non-rigid roads these places will show up at some future date, whereas with a concrete road I believe that the slab often bridges these places and no serious results come except a possible cracking of the road. I think a little too much attention has, perhaps, been paid to thorough rolling of the subgrade rather than to the thorough destruction of the old road surface in order to have a subgrade of uniform density under the new road. In our own work, we did practically no rolling other than that accomplished by traction engines drawing the graders; or, in a few cases, by tractors hauling material.

Width and Thickness.—This is a subject that has given rise to a great deal of discussion. Our practice is to use a flat subgrade with fairly deep ditches alongside the road to care for drainage. Our experience has been that where there is a motor traffic of a thousand or more vehicles every day, an 18-ft. road is none too wide. With only a few hundred vehicles per day a 16-ft. or possibly a 15-ft. road might be ample. In connection with the width we must consider the ever increasing amount of reckless driving occurring upon our highways.

The thickness that we are using on our roads, which are 16 and 18 ft. in width, is 6 ins. at the edges and 8 ins. in the center. I believe the thickness will be ultimately partly determined by the density and homogeneity that we are able to obtain in our concrete. I believe this because a truly homogeneous concrete will have an even wear similar to good sandstone and increased thickness will merely mean an increased life of the road.

Cement.—The getting of the proper amount of cement into the road is, I believe, one of the difficult things to accomplish at the present time, especially where the contractor is inclined to be negligent. This is largely overcome in Milwaukee County by furnishing all cement delivered to the contractor on the job. In this way there is no tendency to slight the proper amount. On the other hand, we hold him responsible within a certain degree for an over-run of cement and also make him responsible for the care of all empty sacks.

I believe that all cement for road purposes should be given thorough testing by reliable engineers. My opinion in this matter has been proven by the fact that we were compelled to reject a considerable number of cars of cement during the past season.

Coarse Aggregate.—In a few words, the better the quality of the aggregate, the better the quality and the longer the life of the road, as in all forms of road construction it is a question of cost versus economy, the high priced aggregate being sometimes more economical than the low priced local material. We prefer a stone graded from ¼ in. to about 1½ ins. and of course demand that it be clean and free from any slate, shale or disintegrated stone. In our state we limit the coarse aggregate to material having a French coefficient of wear of ten or over.

Fine Aggregate.—Wisconsin specifications for fine aggregate read as follows:

> Fine aggregate shall consist of clean, sharp grains of silica or hard silica rocks, and shall not contain over three per cent. of clay or loam. The fine aggregate shall have a reasonably uniform graduation from a size which will pass through a one-quarter inch screen down. Sand, containing an appreciable per cent of flat flakes shall not be used. Fine aggregate other than the above may be used only upon the approval of the engineer.

Pit Run Gravel.—In no case should the use of pit run material in a concrete road be permitted.

Proportions.—I believe that too often the proportions are specified more or less blindly. I believe that they should depend absolutely upon the quality of the material that is obtainable. This necessitates a careful study of the voids and the make-up of the gravel or stone that might be used. I believe that the uniformity of mixing is almost as important as the amount of cement demanded. I believe that the proportions should be those that will give the greatest density and most homogeneous concrete that can be obtained with the sand and stone obtainable. If the addition of hydrated lime or some other inactive material will tend to assist in obtaining these results without lowering the abrasive value of the concrete, I believe it should be included in the porportions. I believe there is a wide field open for careful experiments along this line. Personally, I hope to make some abrasive tests in the near future on different mixes containing hydrated lime. At the present time Wisconsin is using a mix of 1:2:3½, but I would not for a moment say this is the proper mix for all parts of the country and with all aggregates.

Reinforcement.—I believe it is in only exceptional cases that reinforcement is necessary in a country road, these cases being only when springy spots are encountered or possibly where sufficient drainage is impossible due to the swampy nature of the territory.

Mixing.—The proper amount of mixing is another point that is open for discussion and the point I think is most commonly overlooked is the nature of the machinery. I believe that five turns with some mixers are as good as ten with some other mixers. The amount of mixing should also depend upon the shape of the individual pieces in the aggregate and also to a certain extent upon the gradation. In determining the number of turns a mixer should be given, careful attention should be paid to the speed of the drum.

Placing.—For road work proper, I prefer a spout to a boom. The main reason for this is that the material is deposited in smaller quantities, with, therefore, less tendency toward separation of the aggregate and mortar. Very commonly the boom bucket leaks and unless careful watch is maintained there is a pile of mortar left at each moving of the machine. Further, the boom is additional weight to be carried around and is often the cause of delaying the work.

Finishing.—If the concrete is maintained at proper consistency, which is such that it will flow fairly easily into place and not run like water, very little finishing is required. One man can easily keep up with a good sized crew and about all that he should do is to smooth out the markings of the strike-off board and remove any foreign matter such as sticks, coal or clay, which will always float to the surface. The finisher should use a wooden float at least 18 ins. in length and keep a sufficient distance back of the mixer so that the concrete is about ready for its initial set.

Curing.—The first step in curing is to sprinkle the subgrade in dry weather. We find this is best accomplished by the fireman connecting a small hose to the injector. The next step in curing is to protect your road with canvas in case the temperature is over 90° or in case the weather is exceedingly dry and windy. When sufficiently hard, the concrete should be sprinkled and covered with about 2 ins. of earth from the side of the road and then kept wet (and not merely in a moist condition) for about ten days.

Joints.—The question of joints is, I believe, the most unsettled one in connection with concrete roads. We have increased our joint spacings from 25 to 35 ft. and from 35 to 50 ft. and at the present time I see no reason for shortening the spacing. I doubt very seriously the necessity for steel protecting plates, for no matter how carefully they are placed there is a tendency to chip, thus demanding an almost immediate tarring of the joints. I believe the joints of the future will be merely felt or paper with a slight rounding of the joint, with an edging tool, which will be filled in by the pounding down of the felt which has been permitted to stick up above the surface. I believe that the ability to get concrete that is homogeneous and impervious to water will have a marked effect upon the spacing of joints, as water content is more the cause of the movement in concrete than the changes in temperature.

Shoulders.—After trying both gravel and earth shoulders we have practically come to the conclusion that for double track roads, earth shoulders are preferable. We have found that it is not necessary to bevel off the edges of the concrete in order to make the shoulders stay in place and now merely round the edges to about a 1-in. radius.

Inspection.—This article would not be complete without a word regarding inspection, for if there is a type of road that demands thorough inspection it is a concrete road, as mistakes cannot be remedied the day following. The inspector should be a man of judgment who appreciates to the utmost the importance of detailed work. He should be a man of considerable "backbone" and one who has no political connection with the work.

Conclusion.—While concrete in its present form has some disadvantages, I believe that it meets modern traffic conditions as economically as any form of pavement known. I also believe that the next few years will bring about a quality of concrete and form of construction that will produce a country road having a very long life as road surfaces go, especially if traffic conditions continue to change in the direction they are now going; that is, if motor traffic continues to increase while horse-drawn traffic decreases.

Summary of Discussion

The first discussion on Mr. Kuelling's paper was by Frank F. Rogers, State Highway Commissioner of Michigan. According to Commissioner Rogers, concrete roads are no longer looked upon as an experiment and they deserve serious consideration in determining the type of highway to be built when a community can afford from $10,000 to $15,000 a mile for road construction. He described traffic, soil and other local conditions in Michigan and the construction of concrete roads in that state. He expressed the belief that the first few miles, say from two to five, out of each large market town should be provided with a more permanent type of road than is usually chosen.

Commissioner Rogers said that it had been charged by some of the opponents of concrete road that it would be short-lived and that if it did not break under traffic it would crack in the course of a few years by the action of the elements. He said that several years ago he became convinced that a well built concrete road would not wear out under heavy country road traffic in a generation, and accordingly, in September, 1913, arrangements were made with the County Road Commissioners of Wayne County for a systematic count of the defects in every slab on some thirty miles of concrete road in that county. This was done and the record presented by Mr. Rogers in a paper read at the road congress in Detroit, Mich., in October, 1913. A second count of the defects in these slabs was made a year later—in September, 1914. A table showing the result of this second examination was presented by Mr. Rogers and discussed briefly by him.

P. C. McArdle, Acting Chief State Highway Engineer of Illinois, followed Commissioner Rogers. Mr. McArdle spoke first of rolling the subgrade, saying that the practice in Illinois differs from that outlined by Mr. Kuelling. He said that the subgrade of concrete roads, especially in cuts and on fills, must be puddled as well as rolled. Taking up the width of roads, Mr. McArdle expressed the opinion that in the more populous counties and within two or three miles of the largest cities the road should be built 18 ft. wide but that further out a 10-ft. road is ample to take care of the traffic. He held also that there is no necessity for a macadam or gravel shoulder on an 18-ft. concrete road. The thickness of the 18-ft. concrete roads built under the supervision of the Illinois Highway Department, according to Mr. McArdle, is 6 ins. at the sides and 8 ins. at the center, the subgrade being flat. He said that the department has built 17 miles of concrete and brick roads and not one has been found to crack longitudinally.

The cement used in concrete roads should be selected with the greatest care, according to Mr. McArdle, and should be tested very thoroughly; the Illinois department has adopted the method of testing required by the Bureau of Standards at Washington. In the matter of coarse aggregate, according to Mr. McArdle, Illinois is not so well supplied as is Wisconsin; some sections are in about the same condition as Wisconsin but in other sections it is necessary to make the best of the materials at hand. In regard to the specifications for this, Mr. McArdle stated that, like Wisconsin specifications, those of Illinois require a French coefficient of 10 or over but, also in addition to that, a test for toughness. Mr. McArdle expressed the opinion, however, that this test is not a proper test to use and cited illustrations in proof of this contention. In many parts of Illinois, according to Mr. McArdle, there are gravel pits properly equipped to screen and wash gravel and this has been used for the aggregate in concrete roads. The department now has several sections built with stone and gravel which are designed to demonstrate the relative value of these two materials as coarse aggregate.

Another point discussed at some length by Mr. McArdle was that of water in concrete. He stated that he felt that delivery by chute results in too much water in the concrete and that he believed the reduction of the percentage of water to be the most important proposition connected with concrete road construction at present before the engineers of the country. In regard to joints, Mr. McArdle stated that in 1913 and in 1912 the Illinois department had made the joints from 50 to 75 ft. apart, while in 1914 they were placed 100 ft. apart, and in no case, with the exception of one short section, have armored joints been used. He expressed the belief that an armored joint is not advantageous as it has to be maintained the same as any other joint.

After the conclusion of Mr. McArdle's discussion, there followed a general discussion participated in by H. C. French, Superintendent of the Cadwell Sand & Gravel Co., of Windsor, Ont.; W. M. Kinney, of the Universal Portland Cement Co.; Ezra Stoltzfus, of Gap, Pa.; George A. Dingman, Engineer of the Board of County Road Commissioners of Wayne County, Michigan; M. E. Brian, City Engineer of Windsor, Ont.; F. E. Ellis, Manager of the Essex Trap Rock & Construction Co.; H. A. Lumsden, Department of Public Works, Province of

Ontario; J. B. Marcellus, Road Engineer of the Association of American Portland Cement Manufacturers; President McLean; L. Reinecke, of the Geological Survey of Canada; Major W. W. Crosby, Consulting Engineer, Baltimore, Md.; C. B. Anderson, a contractor of Joplin, Mo.; A. W. Van Hafften, of Joplin, Mo., and J. W. Lowell, of the Universal Portland Cement Co. The discussion was principally upon the grade of the aggregates for cement concrete roads, the relative advantages of lake sand and pit sand, the use of stone screenings, the use of hydrated lime in concrete and the use of chats for aggregate.

PRESENT PRACTICE IN EARTH AND GRAVEL ROAD CONSTRUCTION AND MAINTENANCE

By IRA O. BAKER

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Somewhat early in arranging the program for this meeting I was invited to open the discussion of a paper upon earth and gravel road construction; but shortly before the assembly of this convention I was begged to prepare the leading paper upon this topic. After having promised to prepare this paper, I was in great doubt as to the manner of treatment that should be adopted.

In many of our states are highway departments that are doing much valuable work in building state aid roads and in studying the problems concerning road improvement; and the men connected with these organizations need no instruction as to the methods to be pursued in constructing or improving earth and gravel roads. Unfortunately, most of the several state highway departments have little or nothing to do with either the construction or the maintenance of earth and gravel roads, since as a rule their chief function, if not their sole function, is to construct permanent hard roads and safe bridges on the main lines of travel; and consequently the improvement and maintenance of the plebeian earth and gravel roads, particularly the former, is left mainly, if not wholly, to the local authorities. As a result, the earth or gravel roads are not constructed as well as they easily could be, nor are they cared for as well as should reasonably be expected.

This condition has led some to conclude that it is not worth while to attempt to improve an earth road; and that the only thing that can be done is to do every thing possible to secure a hard surface for all the roads possible. Of course, this is a very superficial view; and of course it is impossible to construct a hard surface on more than a small per cent. of the earth roads. In most states to secure a permanent hard surface on even the main roads will require several years. In most localities, at least 90 to 95 per cent. of the highways have only an earth surface; and under even the most enlightened system of state aid road improvement, at least three quarters of the wagon roads for many years to come will have no better surface than can be made of the native surface soil.

Because of their great preponderance, and because of their importance in the industrial and social development of rural communities, earth roads are entitled to much more consideration than they have yet received at the hands of either engineers or local road authorities.

In view of this fact, it may be worth while to briefly consider wherein lies the importance of earth roads, and then what can be done to improve them.

Importance of Earth Roads

Earth roads are important to the financial, social, and educational development of the rural community. The earth roads are the real highways of commerce; and without them there would be but little, if any, use for macadam roads or roads having a better surface. Not much need be said here about the financial advantages of improved earth roads because they are comparatively slight, except in certain restricted areas and for certain relatively unimportant branches of agricultural operations. It is utterly impossible to justify any general improvement of earth roads upon financial grounds alone. The farmer knows what it costs him to market his products, and the average or representative farmer (note the limitation) is sure that no road improvement will materially increase his annual profits. Of course, in the long run the easier of access the market is to the farmer, the lower will be our cost of living; and hence the city dweller is interested in the quality of the roads from the farm to the railroad station. But it will not be profitable to discuss this phase of road improvement further here.

The social effects of the roads of a rural community are in the long run more important than the financial effects. The earth roads are the channels through which the farmer has social intercourse with his rural neighbors and with his friends in the village and nearby towns; and without reasonable facilities for such intercourse this country can not hope to keep upon the farm the brightest and most ambitious of the rural population, either young or old.

Owing to the rapidly increasing population of this country and the practical exhaustion of unoccupied farming land, unless our agricultural operations are more efficient in the future than in the past, an increasing number of people in this country must before long go hungry; and hence every citizen should be intensely interested in maintaining the rural community at its highest efficiency. One way of assisting in securing this desirable end is to give the best possible roads to the farmers.

Closely related to the social advantages of good roads is the effect of improved highways upon the intellectual development of the rural community. The roads from the farm to the village are important factors in the education of the farmer, since good roads permit the consolidation of rural schools or make it possible for the country boy or girl to participate in the larger benefits of the village school. The vital importance to every inhabitant of the establishment and maintenance in this country of a system of both productive and permanent agriculture demands that the social and educational value of earth roads shall have adequate consideration.

Further, an improvement of the earth roads will aid in the industrial development of the rural community and consequently add to the ability and willingness of the farmer to vote additional sums for the improvement of the main roads as well as for the improvement of the local roads.

There is still another aspect in which the roads of a rural community are worthy of more consideration by those who seek to improve the main lines of travel. In nearly all states the farm property pays a very large proportion of the public taxes. Any one who has not investigated this matter will probably be greatly surprised at the proportion of taxes paid by the farming interests. Of course, the proportion of the taxes paid by rural communities will vary with the relative number of cities in the state. In Illinois outside of the county in which Chicago is situated, the farming property in 1912 paid 76.6 per cent. of the taxes. This proportion varied from 36 to 95 per cent. in the different counties. In view of this fact, it would seem to be wise for those who are advocating a system of state aid for road improvement, to give more consideration to the truly rural roads. In most states no far-reaching system of road improvement can be adopted against the wishes of the rural community; and if the farmers feel that their interests are having adequate consideration, they are more willing to accede to the expenditure of considerable sums in improving the main roads.

It is not overlooked that in some states having large cities within their borders, a considerable part of the state taxes are paid by the cities and that consequently in those states the relative importance of the contribution of the rural communities for road improvements is not as great as in the states not having a great metropolis within their borders. Further, the fact is not overlooked that in many states a considerable part of the money spent for road improvements is collected by license fees for automobiles. On the other hand, it should not be forgotten that the number of automobiles owned in the rural communities is rapidly increasing; and as the number owned in the country increases, the rural interest in improved roads will increase in a greater ratio. Of course, a considerable part of the state aid for the improvement of the main roads comes from the state treasury; but the interests chiefly to be benefited by the improvement of earth roads pay a considerable part of the taxes from which that fund is drawn; and further in nearly all plans of state aid for road improvement, the local community pays from one to two dollars for each one from state funds, and hence the agricultural interests usually pay a very large proportion of the contribution for state aid roads. Another important advantage of improving the earth roads is that as the system of state aid roads is extended, the principal earth roads will be given a hard surface and the ordinary methods of improving these roads are the very best preparation for the hard road surface.

From the preceding, it is apparent that there are several important reasons for giving consideration to the proper construction and maintenance of earth roads. It remains then to inquire what can be done to stimulate interest and advancement in this branch of road work.

Drainage

One of the most important features of an earth road is its proper drainage. It is important that all having to do with either the construction or maintenance of earth roads should be impressed with the great value of thorough drainage. The three distinct forms of drainage should be carefully distinguished, viz., underdrainage, drainage by side ditches, and surface drainage by maintaining a smooth and properly crowned surface. The reason for each of these particular forms of drainage and the methods to be employed to secure each should be thoroughly understood by all having to do with the construction and maintenance of earth roads. The principles involved have been so frequently stated and are so easily found in road literature, as to make it unwise to consider them further here.

Maintenance of Earth Roads

The importance of proper maintenance for hard roads has usually been under-estimated by engineers; and hence it is not surprising that the importance of the maintenance of earth roads has been under-estimated by laymen. Now that engineers are coming to appreciate better the importance of maintenance for hard roads, it is hoped that these professional men will assist in creating a proper public sentiment in rural communities in favor of a better maintenance of earth roads. Apparently, editors of engineering journals, particularly those making a specialty of highway work, could be of material benefit by calling attention to the importance of such work and perhaps also by publishing articles suitable for reproduction in the agricultural press.

The difficulties to be overcome in securing any material improvement in the maintenance of rural highways are as much political as technical. The local highway commissioners are elected by their fellow citizens, and the selection depends often as much upon political methods as upon ability, and is often the result of an inefficient man seeking the office for the emoluments rather than because of the possibility of public service. For these and other reasons, the tenure of office is short, and consequently the community is unable to get the fullest benefit from the experience of its road officials. Again, the administrative unit for rural road work is exceedingly small, and consequently the official duties are but an incident in the life of the official; and since he usually has little or no supervision, the very natural result is that he postpones his official duties until a favorable opportunity in his private life.

It would undoubtedly be of advantage to the roads if the administrative unit were larger; but the securing of this change is likely to depend upon the vote of the local community, and the electorate is reluctant to relinquish what it calls self-government. For example, the new road law which recently went into effect in Illinois, provides that towns may vote as to whether or not they will continue under the present method of three highway commissioners or adopt the plan requiring only one highway commissioner. In the greater majority of cases that have come to the knowledge of the writer, the people have voted to continue the three commissioner plan. In other words, they have elected to continue with the smaller administrative unit. It is desirable that those who favor the larger administrative unit should not fail to present their views as opportunity offers, in order that public sentiment may be educated to a more efficient system of road administration.

It is agreed that in many of the states, particularly the older settled ones, the intellectual ability and resourcefulness of the rural community has been decreasing for many years past, owing partly to industrial evolution, and partly to the increase of the non-resident ownership of the land. Therefore, it is the duty of the patriotic citizen to do all within his power to improve the intellectual and social conditions of rural life. One way in which this improvement may be secured is to teach the rural road officer a more effective system of organization and a more efficient method of performing the duties at present allotted to him.

The general introdutcion of automobiles has made necessary in the last decade a complete revision of the methods of hard road construction, and has also made it easier to secure improvements in road legislation and to secure larger sums for highway improvements. Therefore, now is an opportune time to see if improvements cannot be made in the maintenance of earth roads.

Road Dragging

One of the most important things in the maintenance of an earth road is that it shall be dragged whenever the surface becomes roughened through travel while muddy. There are but few rural communities that appreciate at its full worth the importance of the dragging of the earth roads; and those who seek the benefits of road improvement can probably not do better than to aid in creating a healthy public sentiment in favor of this method of road work. Not only is it desirable that public sentiment shall be created in favor of this form of improvement, but in most rural communities it is necessary to develop a thoroughly efficient and economical system of doing this work. More will be said of road dragging presently.

State Highway Commissions and Earth Roads

In some of the states, particularly those in the Mississippi Valley, the state highway commissions are rendering valuable aid in the improvement of earth roads. These commissions prepare addresses and issue bulletins on road subjects, and some of them have officials who give at least a part of their time to the earth roads. Of these commissions, perhaps that of Iowa is doing more for earth roads than that of any other state. The work of the Iowa commission as affecting earth roads will be briefly considered.

Earth Roads in Iowa

The Iowa State Highway Commission has jurisdiction over all the roads and road officials of the state. It has adopted standard cross sections for these roads, has established limiting grades, made rules for breaking long grades, and has made recommendations concerning alignment at railroad crossings and on curves. These rules and regulations have been printed in bulletins which have been widely distributed, and are having an important influence upon the improvement of earth roads in that state. It would be beyond the scope of this paper to attempt to reproduce in detail any of these rules and regulations.

One of the most important features of the Iowa road law and of the work of the Iowa State Highway Commission is the provision made for dragging the earth roads. The law provides for a township superintendent who has charge of all of the road dragging and repair work of the township road system. He makes contracts for dragging the roads, and sees that the work is properly and promptly done. The men who drag the roads are paid from a fund raised especially for that purpose, and which can be used for no other purpose. In 1913 the fund for dragging was $750,000, which is an average of $7.32 per mile. The township superintendent certifies to the correctness of all bills for dragging and for maintenance and repairs, which bills are itemized as to time, place and amount of work done; and without this certification no money can be drawn from the treasury. The pay of the township superintendent does not come from the fund for dragging, and all equipment is paid for from funds other than those provided for dragging of roads. The township superintendent makes contracts with local residents or others for dragging the roads whenever necessary and whenever directed by the superintendent. The price paid is 35 cts. per mile traveled. The contract specifies the form of drag, and the method of using it; and further specifies that the men doing the dragging shall remove all loose stones or sticks from the traveled portions of the highway, and that they shall carry shovels and make any small repairs at culverts and bridges that may be required, and also remove all bumps or accumulations from the road surface. These men are also required to remove any accumulations of grass, weeds, brush, etc., from the culverts and bridges. The contract contains an agreed penalty for the failure to drag the road when needed or when directed. The road official whose duty it is to see that the roads are dragged at the proper time is liable to the law whether the neglect be his own or of others upon whom he has placed the responsibility. This feature of the law has recently been tested in the courts and has been upheld. In the test case the four councilmen of a town were indicted for neglect of duty in failing to drag the roads as provided by law; and upon trial they were found guilty and fined $5 each. For the second offense they are liable to a fine of $500 and a year in the county jail, or both.

Some of the other prairie states could profitably follow Iowa in the provisions for dragging their earth roads.

The New Illinois Road Law

The State of Illinois on July 1, 1913, put into operation a new road law which is very excellently conceived, and which promises to produce marked improvements in the roads of the state. The one feature especially worthy of consideration in this connection is the provision for a county superintendent of highways who has authority over the roads of the county, other than the state aid roads. These officers secure their appointment by the county boards only after having been nominated to the State Highway Commission and having passed an examination under the direction of that commission. The examination to which the candidates for this office were subjected was quite elementary, but was probably as severe as was wise for the introduction of the new law. Even though the examination was very elementary, a very considerable number of candidates were unable to pass; but on the other hand, a number of the candidates apparently could have passed a much more severe examination. At least, some of those who did pass are men of considerable engineering experience.

These county superintendents of highways have been in office only one working season, and it is altogether too soon to determine the full possibilities of the office. Further, practically none of these officials had given any considerable attention to the construction or maintenance of earth roads; and probably none of them had ever considered their official relationship to the local highway authorities. Still further, it is very natural that the local highway officials, having been shorn of part of their authority, should be somewhat jealous of the new county superintendents. Still again, it is not possible through an examination certainly to secure on the part of the county superintendents of highways that degree of tact and managerial ability required for the best results in the supervision of local highway work by the new county officials. Finally, many of these superintendents receive such small pay as not to secure the best men, nor perhaps the most efficient results from the present appointees. Nevertheless, notwithstanding the difficulties and limitations, the plan is working reasonably well, and gives promise of material improvement in the local highways.

Presumably, in accordance with the requirements of the law, all of these officials have inspected all of the roads and bridges at least once during the year. Several of these county superintendents have called the local road authorities together to consider methods of highway construction, maintenance, and administration. At these meetings the county superintendents have not only sought to instruct the local road officials in road matters, but have tried to instill into them high ideals of public service. Further, many of these county superintendents by the use of the local press have sought to stimulate a greater public interest in road improvements in general, and particularly in the improvement of earth roads. The method and spirit of many of these county superintendents is illustrated by the following paragraph from the instructions published by one of them in the official paper, "Illinois Highways," which has been largely reprinted.

"In the spring, as soon as the ground has settled sufficiently to get on them with a tractor, clean out the side ditches, using a 6 or 8-ft. grader and going two or three rounds, as may be necessary. Then follow up with the leveler, pulling the loose dirt into the hollow places and giving the road the proper crown. When this is done, I believe the heavy machinery should be put in a shed and left there. Road drags, under ordinary weather conditions, if timely used will keep the roads in good shape until winter, and even in winter the drags can be used to advantage. In getting the drags used systematically will be the hardest part of the work. The commissioners should make arrangements with farmers along a certain road to drag at the same time when called up by the commissioner or by some one appointed to do so. Of course, the entire length of the road in the township should be dragged; for if parts of it are not, then some of the benefits of the dragging that is done will be lost. The work should be done after rains. If the road is not badly rutted, the dragging need not be done until the ground is partially dried out; but if the surface is uneven, the work should be done while the ground is still wet so as to fill up the hollow places. Some neighborhoods will not take hold of the work at first; but I believe that when they see what is accomplished in other places, they will gradually fall into line. Each man doing dragging should be provided with blanks to be filled in and mailed to the commissioner immediately after doing the work. These slips should state the time, section of road, price per mile, and the amount due for dragging on that date."

Wisconsin Road Law

The State of Wisconsin has a comparatively new road law which provides for a county highway commissioner having much the same authority and duties as the Illinois county superintendent of highways, and he probably finds somewhat the same difficulties and limitations as his Illinois brother official. The ordinary soil and the climatic conditions in Wisconsin are more favorable for earth roads than in either Iowa or Illinois, and are less representative of the states in the Mississippi Valley, and hence nothing will be said about

Wisconsin earth roads. However, Wisconsin fortunately has considerable quantities of gravel suitable for use in roads, and the commission of that state is doing very commendable work in developing a system of scientific gravel road construction which is probably the best of any in this country.

Good Roads Day

The holding of a good roads day in which rural and urban citizens shall join in the construction or improvement of a piece of the public highway is a means of not only securing a piece of improved road, but the observance of such a day can be used to stimulate interest in road work and also to secure a more cordial understanding between the inhabitants of the country and the city. It would not be difficult to offer objections as to the possible efficiency of a good roads day as a means of constructing or improving roads; but such an occasion can be fully justified, provided considerable attention is given to arousing more interest in the roads, and to an interchange of views on highway problems between the different classes of people who use the roads. The experience in some such attempts has been that there was a surprising readiness to cooperate in such public improvements. In not a few instances city chambers of commerce and city automobile clubs have made very substantial contributions for the improvement of the earth roads leading to the cities in which these organizations had their headquarters.

Conclusions

The earth roads are important channels for the commerce of the country, are large factors in the social and church life of rural communities, and are of vital importance to the present rural educational interests and the future industrial developments of agriculture. The very life, credit and prosperity of our country require that the rural community shall have the highest possible development, and the quality of the road from the farm to the village and the town may aid or retard this development. On one hand, the earth roads should not be improved at such expense that the cost will be a real burden upon the community; and on the other hand the roads must not be so poor as to be a bar to the highest reasonable development of the community. In nearly every case the earth roads can be greatly improved without appreciable expense, and with much advantage to the local community and to the entire country.

Summary of Discussion

Professor Baker's paper was discussed first by F. E. Ellis, Manager of the Essex Trap Rock & Construction Co., of Peabody, Mass., who devoted his remarks to practical construction details. Mr. Ellis said that in his opinion the contractor has to deal with no more difficult a problem than that of earth and gravel roads, one reason for this being that the people who pay for the roads, and often new engineers, think that an earth or gravel road can be built as hard and as compact as a macdam or bituminous road and will give the same all-year service.

The first point made by Mr. Ellis in discussing construction was that the gravel for a gravel road should contain clay or loam; otherwise it is lacking in binder and will not compact. He illustrated this point by reference to a road in New Hampshire which has been spoken of as an excellent gravel road. According to Mr. Ellis, it is not a gravel road at all—that is, the surface material will not come under the ordinary specifications for gravel. These specifications, at least in New England and New York, according to Mr. Ellis, call for gravel free from loam or clay. Mr. Ellis contended that it is impossible to build a satisfactory road with such material, and said that the excellence of the New Hampshire road referred to is due to the well drained foundation and a surface composed of what is known in that locality as hardpan, which might be described as clay with a small amount of stone in it.

Mr. Ellis also referred to the matter of crown, saying that it should be greater on grades than on the level so that the water would run off the road at the side instead of along it.

Chairman Meeker said that it is impossible to build a road with clean or washed gravel, that in such a case a road will be free from mud but that traffic will slip and slide on it, that it is very hard on horses and that the tractive force required is very great. On the other hand, a road of clay and gravel gives for eight or nine months in the year one of the smoothest, hardest and most convenient roads for travel that it is possible to build.

The next speaker on this topic was Ezra Stoltzfus, of Gap, Pa., whose principal point was the importance of the earth road. These roads, according to Mr. Stoltzfus, are the roads leading to the railroads and are the feeders of the main arteries of transportation and, therefore, are entitled to more thought than is given to them.

The last speaker on the discussion of Professor Baker's paper was J. H. Marsh, of Oshkosh, Wis., who also took up the matter of the composition of gravel. He agreed with Mr. Ellis that clay or some similar material is necessary in order to secure the proper compaction. He spoke at some length upon the building of pioneer roads, emphasizing the necessity for good alignment in the original construction so as to avoid the excessive cost of correcting the alignment later.

Another point made by Mr. Marsh was that the headwalls of culverts are unnecessary and are obstructions. He said that if instead of putting money into the headwalls it was used to extend the culvert itself 3 or 4 ft. further, much better results could be obtained. He also touched upon the construction of corduroy roads. The correct way to build these, according to Mr. Marsh, is to lay the logs, cover them with 6 or 8 ins. of brush and then with 10 to 12 ins. of clay or heavy soil.

STREET PAVING IN SMALL CITIES

By THOMAS H. MacDONALD

State Highway Engineer of Iowa

No very definite limit has been been fixed as to the point at which the large town caterpillar becomes the small city butterfly. Very much depends upon the point of view. No one will seriously question, however, the right of any corporation, no matter how small its population, to call itself a city, if it may point with pride to even a single paved street. Towns may have electric lights, water works, and sidewalks by the mile, but paved streets, never. Legislatures may write into the laws of the state the limits of population which determine the legal status of towns and cities; but no law can change a sleepy country town into a thriving little city.

Paving promoters are more successful. This conclusion at least must be reached if we believe that the first broad public service that any municipality renders is the building of good streets. All the other first improvements serve the more selfish welfare of the individual and the town. Improved streets serve the best interests of the whole community. Their benefits are neither selfish nor individual. Their usefulness is not limited to those who live within the corporation boundaries, but rather is extended to the whole surrounding territory.

That street improvements should be made by the cities and towns in agricultural communities as rapidly as possible seems only fair, for such improvements provide direct and reciprocal benefits to the agricultural communities upon which so much of the prosperity of these municipalities is dependent.

As indicated by the title, this discussion is limited to small cities. Such a division might easily include the cities of twenty-five to fifty thousand people. Cities of this size have a sufficient support fund to secure competent technical service, and property values are able to withstand paving assessments. There have been volumes written concerning all angles of the paving question, which are applicable to cities of this size.

There are, however, almost innumerable small cities which have serious paving problems, and which have not received due consideration. Because of the large number of these little cities, their aggregate importance to the individual states, and their difficulties in making such improvements, this discussion has been purposely limited to the very small cities.

During the five year period from 1909 to 1913, there were 40 towns in Iowa of less than 15,000 people which built in that time 1,640,000 sq. yds. of pavement of six standard types. The smallest of these towns had only 1,200 people, the largest 14,600, and the average size for the whole number was 4,300 in 1905, increasing to 4,600 in 1910.

It is believed that this average small city is representative of many hundreds all over the United States, but particularly in the Mississippi Valley states, where agricultural conditions are similar. Each little municipality serves a community within a radius of about five miles, and carries on a small manufacturing business. Railroads or electric lines extend the trading radius in certain commodities for perhaps ten or fifteen miles.

Forty such towns for which the correct totals are available have built in five years, the following pavements:

Creosoted wood block........	70,300 sq. yds.
Sheet asphalt	107,700 " "
Bitulithic	201,700 " "
Asphaltic concrete..............	256,500 " "
Brick	484,600 " "
Cement concrete	519,000 " "
Total..............................	1,639,800 " "

In addition to these types there has been a small yardage of other roadways, which are not recognized as standard pavements.

The problems that these municipalities have to meet in obtaining street improvements are grouped as follows:

Lack of experience with pavements of any character.

Lack of an adequate engineering organization.

Property values and property income are low.

Area incorporated is excessive compared to population.

Plans adopted are imitative of larger cities rather than designed to meet small city requirements.

Contracts have small average yardage.

Lack of any comprehensive improvement plan.

To meet these problems the city which builds its first pavement does not have the advantage of the experience which the larger and older cities have obtained as to the best possible types of pavement to use. There is also a lack of an adequate engineering organization. Although a competent city engineer may be employed, the chances are against his having had any wide experience with various forms of street surfacing, and local laboratory facilities are almost entirely lacking.

Property values, comparatively speaking, are low, and the income from the property does not pay a high per cent. on the investment. The average small city has its corporate boundary lines extending far into the sparsely settled surrounding territory, so that its area in ratio to its population is very large. This is one of the penalties which is always paid when a municipality reaches out for more land to tax. The income is not proportional to the required outlay when adequate improvements are made.

When the city is without experience with pavements of any character the first plans adopted have nearly always been imitative of some of the larger cities. It has not been an uncommon occurrence for committees appointed from the representative citizens, the councils or the commercial clubs of small cities all over the Mississippi Valley to visit Minneapolis, Chicago, St. Louis, or some city of equal importance, in order to study types of pavement adapted to their home city of five to fifteen thousand inhabitants.

Another factor which has been a real difficulty is the average size of contracts which are awarded in the small city. From the data available—which are accurate for the past five years—the following results are secured:

For the construction of brick and vitrified brick pavements, contracts average as follows:

1909—Six contracts, average of 15,200 sq. yds. each
1910—Seven " " " 13,300 " " "
1911—Twelve " " " 11,200 " " "
1912—Three " " " 13,500 " " "
1913—Ten " " " 11,500 " " "

In the construction of asphalt pavements this fact has been even more striking. A comparatively expensive plant is required, and contracts have been awarded as follows:

1910—One contract, 10,000 sq. yds.
1912—Two contracts, average of 40,350 sq. yds. each.
1913—One contract, 17,000 sq. yds.

In the construction of creosoted wood block pavements, contracts have averaged as follows:

1909—One contract, 12,470 sq. yds.
1910—Three contracts, average of 16,980 sq. yds. each.
1911—Two contracts, average of 3,530 sq. yds. each.

In the construction of concrete pavements contracts have averaged as follows:

1909—Two contracts, average of 3,500 sq. yds. each
1910—Three " " " 14,200 " " "
1911—Six " " " 13,000 " " "
1912—Six " " " 33,350 " " "
1913—Eleven " " " 17,500 " " "

In the construction of bitulithic pavements, contracts average as follows:

1909—One contract............. 14,000 sq. yds.
1910—Two contracts, average of 56,800 " " each
1911—One contract............. 17,000 " "
1912—One contract............. 6,000 " "
1913—Two contracts, average of 25,500 " " each

In the construction of bitulithic pavements a complete plant is required, even for small contracts.

In the construction of asphaltic concrete pavements, contracts average as follows:

1911—One contract............. 1,100 sq. yds.
1912—Four contracts, average of 39,000 " " each
1913—Five " " " 21,600 " " "

In the construction of asphaltic concrete pavements a complete plant is required, regardless of the size of the contract.

It must be again accented here that this discussion is based entirely upon the actual street improvement record of forty small cities in an agricultural state, and that the facts apply only to conditions of this kind, and not to street improvements in the larger municipalities.

The average size of the contracts, as noted above in detail, it will be admitted, is not sufficient to attract a class of contractors who will devote the best services of their organizations, nor can they supply as complete equipment as is possible on larger contracts.

Another serious problem which the small city necessarily meets is the lack of any comprehensive improvement plan. Frequently the paving program begins with the improvement of a single street, and may not be resumed except in a desultory piecemeal manner. The actual amounts of paving laid do not show any continuity or regularity, but rather a most haphazard plan.

There are in the list of the cities from which these records are taken, a few important exceptions. For instance, one contract was let by one city for nearly 100,000 sq. yds. of one type of pavement. In that case a comprehensive plan was adopted, and the results secured satisfactory.

It will be noted that the entire paving program of these forty representative cities was really based on the standard types of pavement that have been developed by large cities, where traffic requirements are heavy, where property values are high, and the incomes from the property much larger. The street improvements of small cities should not be imitative. The difference in traffic requirements, costs, and future development should each be studied in its true relation and true proportions. The type of pavement which makes a beautiful street in some large center of population is not necessarily the proper improvement to place on the average small city thoroughfare. In fact, if street improvements of this character must be carried on in imitation of the larger cities, then the improvement of many streets, which to be useful to the community must have some surfacing, will be long delayed.

Practically every small city has three quite distinctive types of roads. The business streets proper, the residential streets and the main market roads extending into the surrounding farming community, and forming also a part of the network of main county and state highways. While these three classes of streets may not demand different types of pavement on account of the traffic requirements, they do require different treatments on account of the financial requirements.

The business street of a small city demands a pavement that can be easily cleaned, that will not be injured by large quantities of mud tracked on the surface, that does not in itself originate dust, and that needs a minimum of repairs. If these requirements be met, the cost is not so important, for property values and property incomes are high enough to justify the cost of any of the standard types of pavement. Taking all these factors into consideration, probably the most economical and satisfactory form of pavement for the business streets of the average small city is cement grouted brick on a concrete base.

The residential streets must be studied very carefully. There are very few small cities which have any extended residential districts to improve, in which the cost is not the first consideration. On the main through roads connecting market centers and towns, reasonably wide pavements must be used, but outside of these a single roadway with wide parkings, or a double line of narrow pavement, with a wide center parking should be used to reduce the cost. In the districts where rents and property values are highest, some form of bituminous pavement may be used. For the other districts, bricks, concrete or bituminous coated concrete should be used.

The paving of the main market or country roads through the sparsely built district encountered just within the corporate boundaries of every small city, is usually the most difficult to finance. This has been partly because the improvements have been estimated on the basis of a wide roadway. The actual traffic census over such a road in an average small city showed approximately 900 vehicles of all characters daily. If this is representative, it would be proper to build, beginning with the sparsely settled district, a double track roadway of brick or concrete, and widen the shoulders with gravel or stone, thus treating the street as a main country thoroughfare. In this way such an improvement would not become a financial impossibility.

[Note: Mr. MacDonald's paper was read only by title and was not discussed.—Ed.]

The Road School at Purdue University

A road school was held under the auspices of the School of Civil Engineering of Purdue University at Lafayette, Ind., during the week of January 11. Over one-half of the counties of the state were represented, and about 75 road officials were registered.

The State Association of County Highway Superintendents met during the first two days of the road school.

The instruction was given by the faculty of the School of Civil Engineering of the University, assisted by Dr. L. I. Hewes, of the Office of Public Roads, United States Department of Agriculture, and by several well known engineers who delivered illustrated lectures on various types of highways.

The road school was under the management of George E. Martin, Assistant Professor of Highway Engineering at Purdue.

The Short Course in Highway Engineering at the University of Kentucky.

The short course in highway engineering at the University of Kentucky, which was announced in "Good Roads" for January 2, was held January 4 to 15 and was attended by 172 county highway engineers, judges, magistrates, and others.

According to reports, the school was the most successful yet held by the University, the attendance being more than three times that of last year. Fifty-five counties in the state were represented, 43 of them sending county engineers, 10 sending judges and 26 sending magistrates. The program as outlined in "Good Roads" for January 2 was followed, the work consisting of lectures, demonstrations and field practice. The staff of instructors included members of the faculty of the Engineering Department of the University of Kentucky, members of the State Highway Department of Kentucky, state and county road officials, representatives of road machinery manufacturers, and others. The school was under the general supervision of D. V. Terrell, Professor of Highway Engineering at the University.

GROUP OF COUNTY OFFICIALS AND OTHERS IN ATTENDANCE AT THE KENTUCKY UNIVERSITY ROAD SCHOOL.

Before the close of the road school, resolutions were adopted by those in attendance in which was expressed their appreciation of the efforts of Professor Terrell and others who helped make the school a success.

Duffy Succeeds Carlisle as State Highway Commissioner of New York.

John N. Carlisle tendered his resignation as State Commissioner of Highways of New York on February 2. The resignation was accepted by Governor Whitman, who has named Edwin A. Duffy, a former District Attorney of Cortland County, New York, to succeed Mr. Carlisle.

It is reported that Governor Whitman has abandoned the plan outlined in his message for a commission of three members and that the work will be continued, for the present at least, under the one-commissioner plan.

Mr. Carlisle will remain in the department for a time as adviser to the new commissioner.

Extensive Street Widening in Boston, Mass., has been proposed by Mayor Curley. The streets affected by the proposed work are Exchange, Chauncy and Arch Sts. According to the plans, the widening of Exchange st., between State St. and Dock Sq., from 25 ft. to 60 or 70 ft., will cost $1,250,000, and the widening of Chauncy St., between Essex and Summer Sts., from 40 ft. to 70 ft., and the widening of Arch St., as a continuation to Franklin St., from 50 ft. to 70 ft., would cost about $1,750,000. Bills providing for this work are expected to be introduced in the Legislature.

AMERICAN ROAD BUILDERS' ASSOCIATION

150 NASSAU STREET
NEW YORK, N. Y.

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Through the courtesy of the publisher of "Good Roads," this page, each month, is devoted to the use of the American Road Builders' Association. It is solely in the interests of the Association, and it is the desire of the Executive Committee that all members feel that this space is their own, and that they contribute freely to it, not only as regards anything concerning the Association itself, but also that which will further the good roads movement. Besides the official announcements of the Association, there will appear on the page contributions by members, items of news concerning the Association activities and personal notes about its members. All contributions should be sent to the headquarters of the Association at 150 Nassau Street, New York, N. Y.

Executive Committee:
Geo. W. Tillson
R. A. Meeker
E. L. Powers

A. R. B. A. Members and Road Schools

Both the standing of A. R. B. A. members and the scope of their activities are indicated by the many who have taken part or are scheduled to take part in the work of instruction at the various road schools, so called, which are held by a number of educational institutions and state highway departments during the winter. Among the A. R. B. A. members whose names appear on the programs of these schools are the following:

University of Illinois, Short Course in Highway Engineering, Jan. 11-22—T. R. Agg, Professor of Highway Engineering, Iowa State College; W. T. Blackburn, Consulting Engineer, Dunn Wire-Cut-Lug Brick Co.; W. P. Blackwood, of the Barber Asphalt Paving Co.; S. E. Bradt, Secretary of the Illinois State Highway Commission; W. S. Gearhart, State Highway Engineer of Kansas; A. R. Hirst, State Highway Engineeer of Wisconsin, and Philip P. Sharples, General Manager of the Tarvia Department, Barrett Mfg. Co.

University of Kentucky, Short Course in Highway Engineering, Jan. 4-15.—Will P. Blair, Secretary of the National Paving Brick Manufacturers' Association; Daniel B. Luten, Consulting Engineer, Indianapolis, Ind.; Russell L. Morris, Professor of Highway Engineering, University of West Virginia; Jesse Taylor, President of the Ohio Good Roads Federation; Robert C. Terrell, State Commissioner of Public Roads of Kentucky, and A. D. Williams, Chief Road Engineer of West Virginia.

University of Michigan, Short Course in Highway Engineering, Feb. 15-20.—Major W. W. Crosby, Consulting Engineer, Baltimore, Md.; E. N. Hines, Chairman, Board of County Road Commissioners of Wayne County, Michigan; Prevost Hubbard, Chemical Engineer, Institute of Industrial Research, Washington, D. C., and Frank F. Rogers, State Highway Commissioner of Michigan.

Ohio State University, Winter Good Roads School, Jan. 25-Feb. 20.—Will P. Blair, Secretary of the National Paving Brick Manufacturers' Association; Frank D. Lyon, Secretary of the Inter-State Stone Manufacturing Association, Columbus, Ohio; James R. Marker, State Highway Commissioner of Ohio; J. E. Pennybacker, of the U. S. Office of Public Roads; W. C. Perkins, Engineer, Dunn Wire-Cut-Lug Brick Co.; Frank F. Rogers, State Highway Commissioner of Michigan; Philip P. Sharples, General Manager of the Tarvia Department, Barrett Mfg. Co., and Francis P. Smith, Consulting Chemist and Paving Engineer, New York, N. Y.

Wisconsin Highway Commission, Fourth Annual Road School, Feb. 1-5.—T. R. Agg, Professor of Highway Engineering, Iowa State College, and A. R. Hirst, State Highway Engineer of Wisconsin.

A. R. B. A. Notes.

Charles J. Bennett has been reappointed State Highway Commissioner of Connecticut by Governor Holcomb.

John H. Gordon, a contractor of Albany, N. Y., has been elected President of the New York State Road Builders' Association.

Past President Nelson P. Lewis, Chief Engineer of the Board of Estimate and Apportionment of New York City, delivered a lecture on city planning at a recent meeting of the Engineering Society of the Brooklyn Polytechnic Institute.

President W. A. McLean, Chief Engineer of Highways and Commissioner of the Ontario Public Roads and Highways Commission, recently made an address before the Engineering Society of the University of Toronto, Toronto, Ont.

Among the speakers at the recent annual meeting of the New Jersey Association of County Engineers held at Trenton, N. J., were the following A. R. B. A. members: Col. E. A. Stevens, State Commissioner of Public Roads; Fred A. Reimer, County Engineer of Essex County; A. H. Nelson, County Engineer of Atlantic County; Alvin B. Fox, County Engineer of Middlesex County; Garwood Ferguson, County Engineer of Passaic County; T. J. Wasser, County Engineer of Hudson County; Frederick W. Salmond, County Engineer of Warren County, and R. B. Gage, Chemist, of the State Department of Public Roads.

Among those who gave lectures before the graduate students in highway engineering at Columbia University during the past month were the following A.R.B.A. members: Walter H. Fulweiler, Chief Chemist of the United Gas Improvement Co.; Philip P. Sharples, Manager of the General Tarvia Department, Barrett Mfg. Co.; Major W. W. Crosby, Consulting Engineer, Baltimore, Md., and William H. Connell, Chief, Bureau of Highways and Street Cleaning, Philadelphia, Pa. Mr. Fulweiler lectured on Jan. 4 on "Manufacture of Refined Water Gas Tar," Mr. Sharples on Jan. 5 on "Chemistry, Manufacture and Testing of Refined Coal Tars and Methods of Transportation," Major Crosby on Jan. 11 on

"Preliminary Investigations in Highway Engineering—Value and Methods Employed" and Mr. Connell on Jan. 18 on "Special Features in Street Cleaning Work—Snow Removal and Annual Municipal Clean-Up Week."

Henry G. Shirley, Chief Engineer of the Maryland State Roads Commission, is scheduled to present a paper on road maintenance at the fourth annual meeting of the Virginia Road Builders' Association, which will be held at Murphy's Hotel, Richmond, Va., on Tuesday and Wednesday of next week.

George W. Tillson, Consulting Engineer to the President of the Borough of Brooklyn, New York, N. Y., and for the past year First Vice President of the A.R.B.A., delivered a course of lectures on street paving at Harvard University during January. These lectures are supplementary to the course in the Administration of Municipal Sanitation at the University. Mr. Tillson's schedule of lectures was as follows: Jan. 11, History and Development of Pavements; Jan. 13, Asphalt and Other Bituminous Pavements; Jan. 15, Stone Block and Brick Pavements; Jan. 18, Wood and Concrete Pavements; Jan. 20, The Theory of Pavements; Jan. 22, The Direct Relation of Pavements to Traffic.

H. W. Durham, M.Am.Soc.C.E., who has been Chief Engineer of Highways of the Borough of Manhattan, New York, N. Y., since 1913, left that position on February 1. Previous to his appointment as Chief Engineer of the Bureau of Highways of the Borough of Manhattan, Mr. Durham was Resident Engineer in charge of highway and other work in the city of Panama and vicinity under the Isthmian Canal Commission, and later Resident Engineer on the Cape Cod Canal. He was appointed Chief Engineer of Highways of Manhattan by Borough President McAneny and during his incumbency of that office had charge of very extensive repaving work. He was one of the representatives of the City of New York at the Third International Road Congress at London in 1913, and after the close of the congress spent several months studying pavements and paving methods in British and European cities.

REPORTS

NEW YORK STATE COMMISSION OF HIGHWAYS; Report Covering the Year of 1914, Presented to the Legislature January 1, 1915. Paper; 6x9 ins., 54 pp.

ENGINEER DEPARTMENT OF THE DISTRICT OF COLUMBIA; Report of the Operations of the Department for the year ending June 30, 1914. Paper; 6x9 ins., 310 pp.

MONTANA HIGHWAY COMMISSION; Report for the Years 1913-1914, Submitted to the Governor by George R. Metlen, Secretary, under date of December 1, 1914. Paper; 6x9 ins., 16 pages.

MICHIGAN STATE HIGHWAY DEPARTMENT; Fifth Biennial Report of the State Highway Commission for the two fiscal years ending June 30, 1914. Cloth; 6x9 ins., 124 pp.; illustrated; insets.

OREGON STATE HIGHWAY COMMISSION; First Annual Report of State Highway Engineer Henry L. Bowlby, covering the period from June 3, 1913, to November 30, 1914. Paper; 6x9 ins., 244 pp.; illustrated; insets.

WASHINGTON STATE HIGHWAY DEPARTMENT; Report of the Department for the period from October 1, 1912, to October 1, 1914, Submitted to the Governor under date of October 15, 1914. Paper; 6x9 ins., 192 pp.; illustrated.

WILMINGTON, DELAWARE, STREET AND SEWER DEPARTMENT; Twenty-seventh Annual Statement of the Board of Directors of the Street and Sewer Department, for the fiscal year ending June 30, 1914. Paper; 6x9 ins., 108 pp.; insets.

COMING MEETINGS

February 9-10.—Virginia Road Builders' Association.— Fourth Annual Meeting, Murphy's Hotel, Richmond, Va. Secretary, F. D. Henley, P. O. Box 1056, Richmond, Va.

February 9-12.—American Concrete Institute.—Convention at Chicago, Ill. Secretary, E. E. Krauss, Harrison Bldg., Philadelphia, Pa.

February 10-17.—Cement Products Exhibition Company.— Eighth Chicago Cement Show, Coliseum, Chicago, Ill. General Manager, J. P. Beck, 208 South La Salle St., Chicago, Ill.

February 15-16.—National Paving Brick Manufacturers' Association.—Convention, Hotel Statler, Detroit, Mich. Secretary, Will P. Blair, Engineers Bldg., Cleveland, Ohio.

March 9-12.—Michigan Good Roads Association.—Seventh Annual Convention, Grand Rapids, Mich. Secretary, A. A. Anderson, Hastings, Mich.

March 22-26.—Dominion Good Roads Association and Ontario Good Roads Association.—Second Canadian and International Good Roads Convention, Convocation Hall, Toronto, Ontario, Canada. Secretary-Treasurer, George A. McNamee, 909 New Birks Bldg., Montreal, P. Q., Canada.

Second Canadian and International Good Roads Convention

The Second Canadian and International Good Roads Convention, which is to be held at Toronto, Ontario, March 22-26, is to be conducted under a somewhat different plan from that followed last year, according to an announcement recently made by George A. McNamee, Secretary-Treasurer. It is announced that instead of the usual "lecture" the committee in charge of the meeting will undertake an educational campaign with the idea of placing before the meetings, in a clear and concise manner, facts and cost data on the practical side of road improvement. These are to be presented in papers delivered by prominent authorities from the United States and Canada.

The convention is held under the joint auspices of the Dominion Good Roads Association—W. A. McLean, President, and G. A. McNamee, Secretary-Treasurer—and the Ontario Good Roads Association—J. A. Sanderson, President, and George S. Henry, M.P.P., Secretary-Treasurer.

The officers of the convention are: President, W. A. McLean, Commissioner and Chief Engineer of Highways for the Province of Ontario and President of the American Road Builders' Association and of the Dominion Good Roads Association; Vice President, J. A. Sanderson, President of the Ontario Good Roads Association; Secretary-Treasurer, George A. McNamee, Secretary-Treasurer of the Dominion Good Roads Association; Convention Committee: B. Michaud, Deputy Minister of Roads of the Province of Quebec; S. S. Squire, First Vice President, Ontario Good Roads Association; George S. Henry, M.P.P., Secretary-Treasurer, Ontario Good Roads Association; C. O. Hezzelwood, President, Canadian Automobile Federation.

An exhibition is to be held in conjunction with the meeting.

American Concrete Institute

Concrete roads and bridges will be the matters considered at the three sessions on the first day of the eleventh annual convention of the American Concrete Institute at the Auditorium Hotel, Chicago, Ill., February 9 to 12. The program for Tuesday, February 9, is as follows:

Morning session, 10 a.m.—Opening address of welcome; "Review of Present Practice in Concrete Road Construction," Percy H. Wilson, Secretary, Association of American Portand Cement Manufacturers; "The Experimental Concrete Road in Philadelphia," William H. Connell, Chief, Bureau of Highways and Street Cleaning, Philadelphia, Pa.; "Reinforcing Narrow Concrete Roads," John Mueller, civil engineer, New Castle, Ind.; Report of Committee on Concrete Roads, A. N. Johnson, Highway Engineer, Bureau of Municipal Research, New York, N. Y., Chairman.

Afternoon session, 3 p.m.—"Comparative Cost of Concrete Roads," Percy H. Wilson, Secretary, Association of American Portland Cement Manufacturers; "Cost of Construction and Maintenance of Concrete Roads," H. J. Kuelling, County Highway Commissioner of Milwaukee County, Wisconsin; "The Construction of Integral Curbs," Charles E. Russell, City Engineer, Highland Park, Ill.; "Organization and Methods of Constructing Concrete Roads," William M. Acheson, Division Engineer, New York State Highway Commission.

Evening Session, 8 p.m.—"Test of a Reinforced Concrete Slab Bridge," E. B. McCormick, Mechanical Engineer, Office of Public Roads, U. S. Department of Agriculture; "Standard Designs for Concrete Highway Bridges and Culverts," C. B. McCullough, Designing Engineer, Iowa State Highway Commission; Report of Committee on Standard Specifications for Concrete Highway Bridges and Culverts, Willis Whited, Bridge Engineer, Pennsylvania State Highway Department, Chairman.

The Cement Products Exhibition Co., under the auspices of which the Eighth Chicago Cement Show will be held Feb. 10-17, has announced the date the Ninth Chicago Cement Show, which will be held in the Coliseum, Chicago, Ill., Feb. 9-16, 1916. It is announced that the drawing for spaces will be held on Feb. 12 during the coming show, thus enabling exhibitors to attend in person.

In connection with the seventh annual convention of the Michigan Good Roads Association, which will be held at Grand Rapids, Mich., March 9-12, there is to be held an exhibition which has been designated as the "Michigan Exposition of Road Building Machinery, Equipment and Materials." The officers of the exposition are: Chairman, Alvah Brown, Chairman of the Kent County (Michigan) Road Commission; Vice President J. Hackley Skinner, Kent County Farm Agent; Secretary, Clarence K. Whiting Secretary-Engineer, Kent County Road Commission; Treasurer, Eugene D. Conger, Vice President, People's Savings Bank.

NEWS NOTES

The City of Paris, Tex., has recently authorized the issuance of $200,000 in bonds, of which $100,000 is for street paving. The bond issue carried by a large majority.

The Issuance of Road Bonds in Volusia County, Florida, is under consideration. It is proposed to raise $350,000 and to use a portion of the money in the construction of a brick or concrete road from Ormond to the DeLand district line.

Location Surveys on 2,063 Miles of State Highways in California have been completed, according to a recent report. It is also stated that 1,068 miles of roads are either completed or under contract and that awards are pending on a large additional mileage.

Among the Bills to be Introduced in the California Legislature, according to reports, is one which provides for taking the county road work out of the hands of the boards of supervisors. This bill, for which Assemblyman Sharkey of Contra Costa County is sponsor, provides for centralizing all control over highway construction and repair in the county surveyors and also for substituting for the road district funds a general county road fund.

PERSONAL NOTES

O. H. Lange has been elected City Engineer of Quitman, Ga.

C. A. Ashley has been appointed City Engineer of Naperville, Ill.

R. V. Orbison has been elected City Engineer of Pasadena, Cal.

J. W. Barnett has been reelected City Engineer of Athens, Ga.

E. E. Lathrop has been elected City Engineer of Fitchburg, Mass.

H. J. Hammer has been reappointed City Engineer of Gloversville, N. Y.

F. J. Hager has been appointed Commissioner of Public Works of Rome, N. Y.

R. A. Hamilton has been appointed Commissioner of Public Works of Rochester, N. Y.

T. J. Wasser has been reappointed County Engineer of Hudson County, New Jersey.

Grant Davis has been reappointed County Engineer of Hunterdon County, New Jersey.

E. L. Gates, of Wheaton, Ill., has been appointed Superintendent of Highways of DuPage County.

Milton Maggini has been appointed City Engineer of San Jose, Cal., succeeding I. L. Ryder, resigned.

Charles Pettit has been appointed County Surveyor of Ventura County, California, succeeding E. E. Everett.

P. W. Sylvester has been reappointed City Engineer and Superintendent of Public Works of Poughkeepsie, N. Y.

James Sourwine has been appointed County Surveyor of San Bernardino County, California, succeeding Shirley Bright.

E. P. Dewey, for several years City Engineer of Long Beach, Cal., has been appointed Deputy City Engineer of Pasadena.

F. S. Parkhurst, Jr., and J. J. Conroy have been appointed City Engineer and Superintendent of Streets, respectively, of Niagara Falls, N. Y.

Julien Smith, of Sehua, Ala., has been appointed a member of the Alabama State Highway Commission, succeeding V. B. Atkins, resigned.

A. E. Christhilf, formerly President of the Baltimore Asphalt Block & Tile Co., now has charge of the Baltimore business of the Union Paving Co., of Philadelphia, Pa.

Eugene W. Stern, M.Am.Soc.C.E., Secretary of the Institute of Consulting Engineers, has been appointed Chief Engineer of Highways of the Borough of Manhattan, New York, N. Y., to succeed H. W. Durham, M.Am.Soc.C.E.

Geo. A. Dalrymple, Superintendent of Road Work for the Revere Beach Division of the Metropolitan Park Commission of Massachusetts, died at his home in Revere on Jan. 3. Mr. Dalrymple was formerly Superintendent of Streets of Revere.

Brig. Gen. Theodore A. Bingham, C.E., U.S.A., retired, for the past few years Consulting Engineer of the Department of Bridges of New York, N. Y., and L. S. Moissieff, M.Am.Soc.C.E., Chief of the Division of Design of the Department of Bridges of New York, N. Y., retired on Feb. 1 because of the abolition of the two offices.

C. K. Clark, a consulting engineer of Los Angeles, Cal., who was formerly connected with the work of the California Development Co., has become City Manager of Tucson, Ariz.

W. B. Clancy, A. P. Campbell and S. C. Evans, members of the Riverside County (California) Highway Commission, whose terms expired on Jan. 1, have been reappointed for another one-year term.

John H. Gordon, of Albany, N. Y., has been elected President of the New York State Road Builders' Association for the year 1915. Other officers elected are Vice President I. O. Cole, Rochester, N. Y.; Honorary Secretary, John J. Ryan, Albany, N. Y.; Secretary, J. W. Manion, Albany, N. Y.; Trustees: A. DeGraff, Kingston, N. Y.; John E. Johnson, Buffalo, N. Y.; I. J. Morris, Albany, N. Y.; T. C. Brown, Schenectady, N. Y.; T. H. Gill, Boston, Mass., and Richard Hopkins, Troy, N. Y.; Ex-officio: A. J. Rockwood, Rochester, N. Y.; Joseph Walker, Albanfy, N. Y., and S. B. Wagenen, Roundout, N. Y. Messrs. Rockwood, Walker and Van Wagenen are ex-presidents of the association.

NEWS OF THE TRADE

Frost Proofing Compound for Concrete

There has recently been put on the market a material for preventing concrete from freezing while setting.

This material is described as a fine, white substance much like cement in appearance. It is used by mixing a little with each batch of cement, and it is stated that tests have been made demonstrating that concrete treated in this way will not freeze at a temperature as low as six degrees below zero—the lowest temperature obtained when the tests were made. It is also stated that in a briquette test the briquette containing the compound showed somewhat greater strength in compression at the end of 7 days than did the concrete made without the compound. It is also claimed that the compound retards the rusting of iron.

It is stated that the extra cost of the concrete when the compound is used is about 75 cts. per cu. yd. The compound is known as "Lansing Frostproofing" and is manufactured by the Lansing-Company, of Lansing, Mich., which controls the patent rights.

Exhibit of the Universal Portland Cement Co. at the Chicago Cement Show

A detailed description of the exhibit which will be made at the Eighth Annual Chicago Cement Show has recently been made public by the Universal Portland Cement Co., of Chicago, Ill.

The company has taken a large amount of space and has arranged for an attractive display showing various uses of concrete, among them its utilization in road building. In this portion of the exhibit there will be displayed specimens of well known and typical pavements and suggestions for the construction of concrete pavements in streets and alleys and on highways.

Present standard methods of concrete road building are to be illustrated by a complete model which will include a typical paving machine, manned by the necessary crew, and piles of the various materials used distributed at convenient places for the work. In front of the movable concreting plant will be seen the original earth road, while in the rear there will be the finished concrete pavement. The model will include all the details, such as the wheelbarrows, pipe lines for the water supply, portable forms, striking boards, floats and the like. An explanation of the model will be distributed in the form of printed descriptions.

Granite Paving Block Manufacturers' Association of the United States

At a recent meeting of the Granite Paving Block Manufacturers' Association of the United States, the organization of which was noted in "Good Roads" for December 12, 1914, arrangements were made with Clarence D. Pollock, M.Am. Soc.C.E., to act as Consulting Engineer for the association for 1915, and with Zenas W. Carter, of Boston, Mass., to handle the publicity and outside work as Field Secretary.

Mr. Pollock is now engaged in private practice as consulting engineer on pavement and other work. He was at one time Acting Chief Engineer of the Bureau of Highways of the Borough of Manhattan, New York, N. Y., and has had over 20 years' experience in paving work in New York, Texas and Cuba. Mr. Carter formerly had charge of publicity and promotion work for the Electric Development Association.

It is announced that the association intends to publish a series of bulletins and data sheets covering modern methods of manufacturing and laying smooth granite blocks. The headquarters of the association will be at 54 Devonshire St., Boston, Mass., and it is announced that the association will furnish information relative to the use of granite block for paving purposes on request.

"Get Together" Meeting of the Troy Wagon Works Co.

The Troy Wagon Works Co., of Troy, Ohio, held a salesmen's convention, designated as the "First Annual 'Get Together' Meeting," at Troy, Ohio, on January 6, 7 and 8. It was attended by the field staff of the company, as well as the home office force.

The program included discussions of the construction of the various Troy products and the different phases of salesmanship, social and entertainment features, factory inspections and general discussions. A large part of the first day was spent in the factory watching the manufacture of wheels. In the evening, W. F. Jolley, Sales Manager of the company, entertained the field force at a dinner at his home, followed by a smoker. On the second day those in attendance watched the building of trailers in the factory, and on the last day a talk was given by W. E. Long, Vice President of the Geiger-Jones Co., of Canton, Ohio.

One of the features of the convention was an exhibition of the company's various products; 34 wagons and 6 trailers, all of different kinds, were shown. They were arranged side by side in a long line and included farm wagons, dump wagons, reversible traction wagons and log wagons, and motor truck trailers of various sizes.

The meeting was so successful that it has been determined to make it an annual affair.

The Highway Construction Co. has been incorporated at Elyria, Ohio. The company will engage in road and street work and will have offices in the Turner Bldg. at Elyria. S. A. Horvitz is President and Treasurer of the company and L. W. Conabee is Vice President.

On the first of this month, the general offices of the Asbestos Protected Metal Co. were transferred from the Beaver Falls plant to the First National Bank Bldg., Pittsburgh, Pa. The manufacturing operations of the company will be continued as heretofore at Beaver Falls, Pa., and at Waltham, Mass.

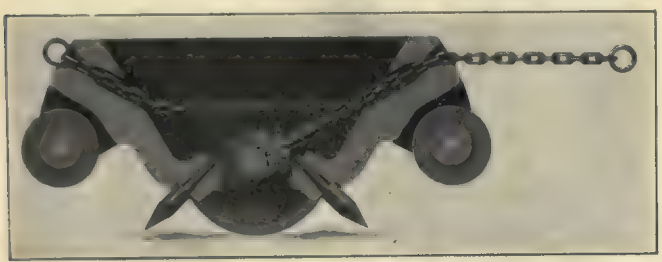
Arthur C. Vicary, formerly of Loraine, Ohio, has recently become Sales Manager of the Steam Shovel Department of the Ball Engine Co., of Erie, Pa. This company is now placing on the market a line of revolving shovels under the name of the "Erie" steam shovels.

NEW MACHINERY AND APPLIANCES

Road Scarifier

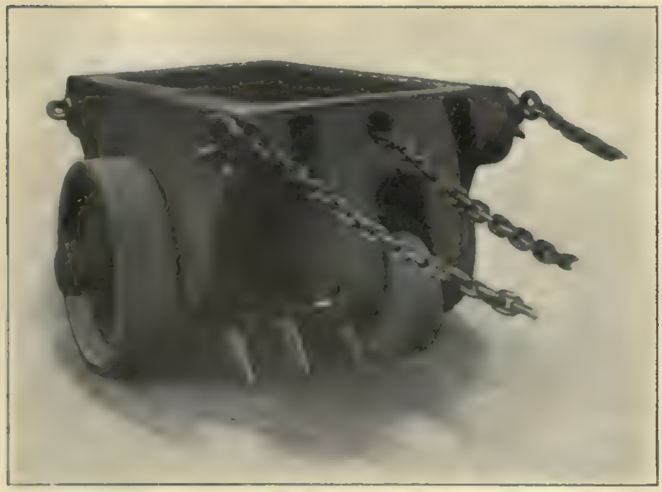
The accompanying illustrations show a scarifier of a new type which has recently beeen brought out.

The scarifier, as shown in the reproduction of a photograph of it and in the sectional drawing, consists essentially of a heavy casting carried on two wheels and provided with a guide wheel at each end, picks, and the traction device. The cutting depth is regulated by the adjustment of the gauge wheel in any one of three positions by inserting the shaft of the wheel through the proper hole.



WRIGHT-LEHIGH SCARIFIER—SECTIONAL VIEW SHOWING DRAFT CHAIN AND SPRING.

The special feature of the scarifier is the traction device. The machine is equipped with three chains for attachment to the roller or traction engine used for hauling. The two chains at the sides are attached in the usual manner, while the middle chain is attached to a spring in the center of the scarifier, as shown in the sectional view. This spring acts as a cushion which absorbs the first shock of starting and the shocks occasioned by bowlders or hard spots encountered in the road. In operation, the first pull comes on the spring, but before the spring has been stretched to its limit the two side chains take the load.



WRIGHT-LEHIGH SCARIFIER—GENERAL VIEW.

The special claims made for the machine are that the spring prevents undue strain on the roller or traction engine; that the machine requires no steering, and that it is reversible with the minimum of labor.

The machine, which is known as the Wright-Lehigh scarifier, weighs 6,000 lbs. It is manufactured by the Lehigh Foundry Co., of Fullerton, Pa.

Road Planer, Grader and Ditcher

A new machine for grading and planing roads is shown in the accompanying illustrations, one of which shows the details of the machine and the other shows one of the earlier forms of the machine in actual operation.

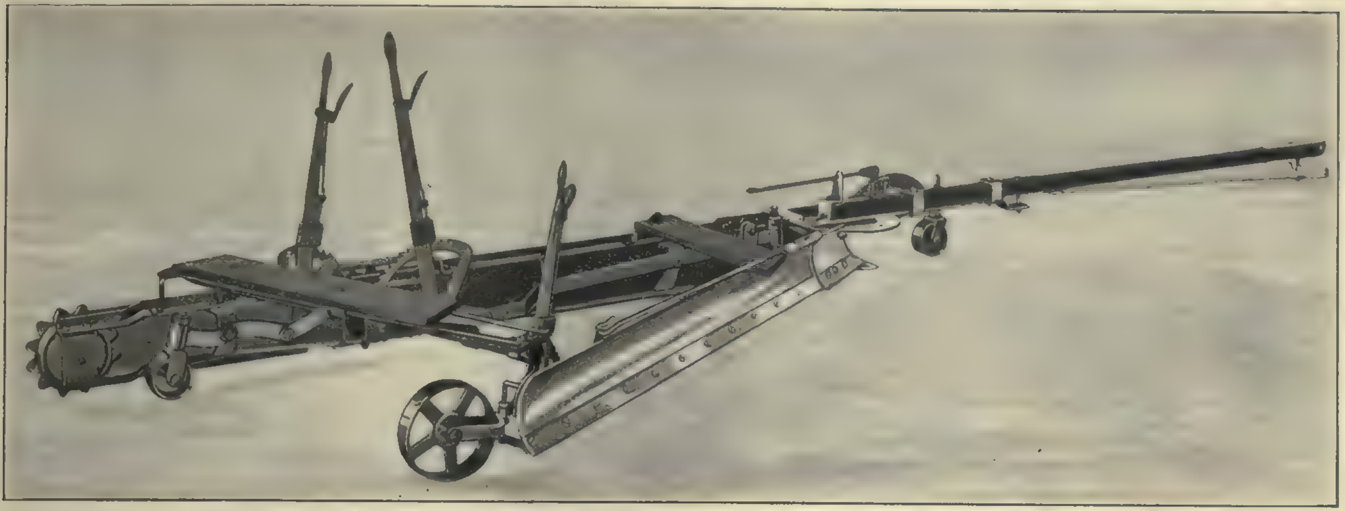
The apparatus, as may be seen from the large illustration, consists essentially of a frame carrying a plow point and moldboard, guide wheels, platform for the operator and levers for the control of the cut. The left-hand side of the machine, designated by the inventor of the grader as the "land-side," is 16 ft. long and terminates in a toothed guide wheel, as shown. There is another similar wheel further forward, which may be seen near the two levers. These serve to keep the "land-side" of the machine in the cut made by the plow point. There are also four other guide wheels, three of which may be seen in the illustration.

ZINDORF GRADER IN OPERATION ON NEW WORK.

The right-hand side of the machine consists of a mold board, provided at the forward end with a hinged connection with the other side and capable of adjustment to any width of cut from 3 ft. 6 ins. to 7 ft. 6 ins. At the front of the machine is a plow point.

The depth to which the machine cuts is regulated by the small wheel on the goose-neck at the front of the machine and by another wheel, which does not show in the illustration, which is situated within the machine just back of the point. The maximum depth of cut is regulated by adjusting the guide wheel on the goose-neck. The guide wheel just back of the point is controlled by the forward lever on the left-hand side of the machine, by which the wheel can be raised or lowered to make the machine cut to any depth up to the limit fixed by the guide wheel at the front. The other two levers raise and lower the small guide wheel just forward of the rear end on the "land-side" and the larger wheel at the rear of the moldboard. This latter wheel may be raised or lowered to adjust the cutting edge of the moldboard to any desired crown. The machine may be raised clear of the ground by lowering the two adjustable guide wheels at the rear and the adjustable guide wheel just back of the point. All of these adjustments are controlled by the operator standing on the platform shown at the rear of the machine.

The chief advantage claimed for the machine is that it



ZINDORF PLANER, GRADER AND DITCHER—GENERAL VIEW.

automatically maintains the same horizontal plane. Other claims are that its construction is simple and durable; that the pole is so placed that the machine follows the near horse, thus forming the ditch and grading up to the center of the roadbed with an even crown, and that it is easily operated.

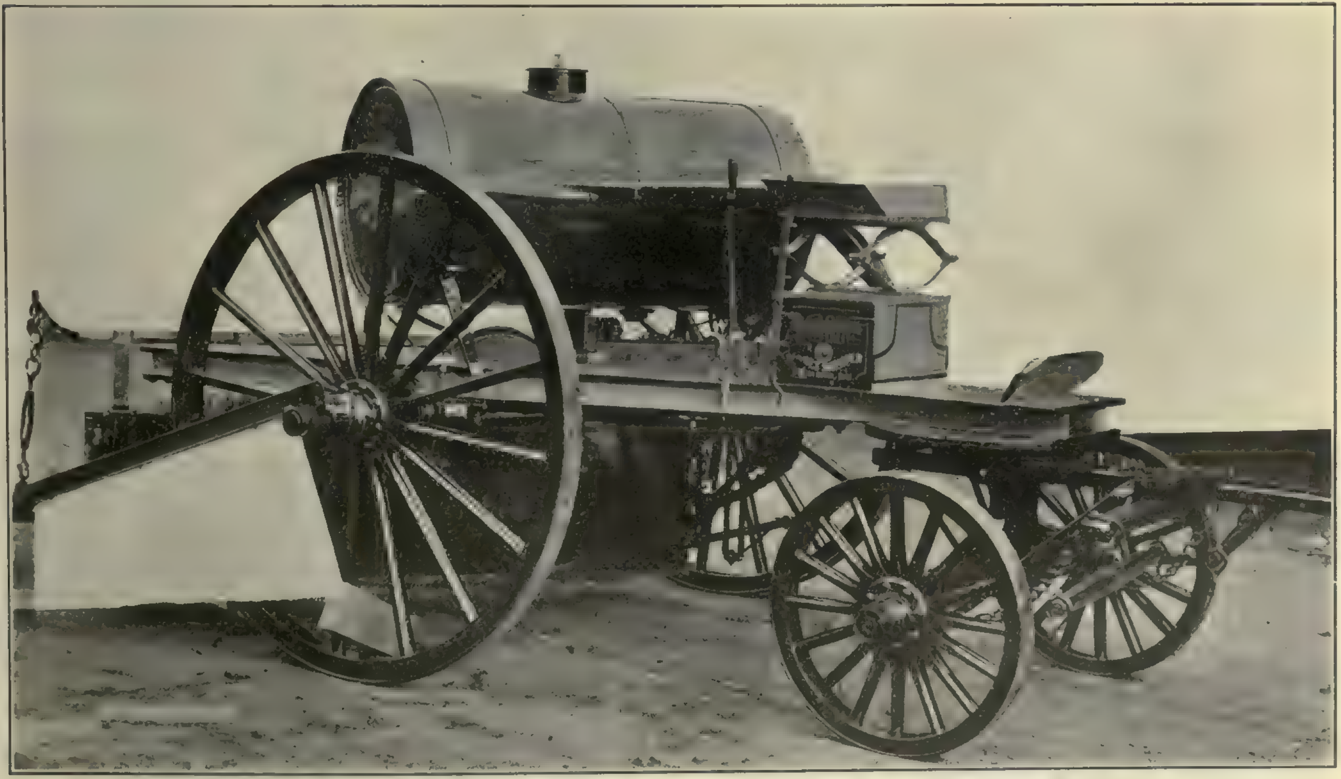
It is stated that four horses are required to operate the machine in trimming up old roads, while six are used for grading new roads.

The machine is the invention of M. P. Zindorf, of Seattle, Wash., who built one of them for his own use about six years ago and has since used the machine in his own work. He has obtained a basic patent on the machine, and is at present in the East arranging for its manufacture and sale, with a view to putting it on the market in a short time. Mr. Zindorf's Washington address is the Alaska Bldg., Seattle, and his present eastern address is 551 West 157th St., New York, N. Y.

Combination Street Sweeper and Sprinkler

In the accompanying illlustration is shown a combination street sweeper and sprinkler which is a recent addition the Studebaker line of machinery for street and road work.

The machine consists of the company's standard "Acme" street sweeper combined with a sprinking attachment consisting of a tank and distributing and controlling mechanism. The frame is made of steel, the body being covered with a tight deck. The rear wheels are of the "Archibald" type and the front wheels are of the Sarven patent. The broom, which is mounted at the rear of the machine, is at an angle of a little more than 30 degrees with the rear axle and is supported in babbitted ball and socket bearings. An angle bar extending from the broom suspension to the right rear axle protects the broom from obstructions. The broom is driven by a link belt from a sprocket on the counter-



STUDEBAKER COMBINATION STREET SWEEPER AND SPRINKLER.

shaft, which is mounted just forward of the front axle and is driven from the axle through a beveled gear.

The front gear has a solid collar Concord axle, a transom plate that carries the load and relieves the strain on the kingbolt and a 16-in. full circle fifth wheel. The broom is reversible and is provided with an iron shield in front and an apron at the right-hand side. The angle of the broom may be adjusted by means of a turnbuckle connecting two rods extending from the left-hand end of the counter-shaft and from the left-hand suspension of the broom.

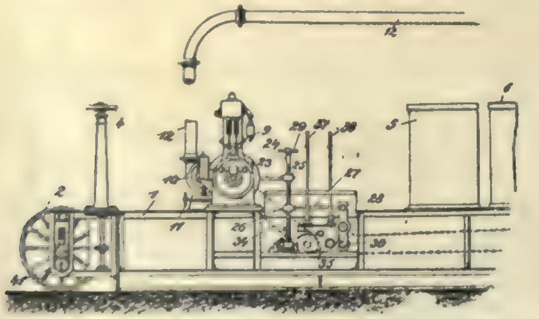
The tank has a capacity of 175 gals. and is mounted at the rear of the machine, as shown in the illustration. It is discharged through a perforated pipe placed parallel with and just in front of the broom.

The broom and water discharge are controlled by levers operated from the driver's seat. The equalizing lever may be adjusted to give any desired broom pressure and automatically locks to hold the broom away from the pavement when not in service. Another lever throws the broom in or out of gear.

The machine is manufactured by the Studebaker Corporation, of South Bend, Ind., and is made in three sizes having broom lengths of 7, 8 and 9 ft., respectively.

RECENT PATENTS

The following list contains the numbers of the principal patents relating to roads and pavements and to machinery used in their construction or maintenance which have recently been issued, together with the names and addresses of the patentees, dates of filing, serial numbers, etc. In some cases the principal drawing has also been reproduced. Printed copies of patents listed may be obtained for 5 cts. each by application to the Commissioner of Patents, Patent Office, Washington, D. C.



1,122,384. MACHINE FOR HEATING THE SURFACE OF ROADS FOR COVERING THE SAME WITH POURED ASPHALT. Alfio Grasso, Livorno, Italy. Filed Mar. 17, 1913. Serial No. 755,054. (Cl. 94-6.)

1,122,504. BRIDGE CONSTRUCTION. George Huebner, Lagrange, Tex. Filed June 2, 1914. Serial No. 842,430. (Cl. 14-9.)

1,122,704. BRICK CUTTING MACHINE. Frank B. Dunn, Conneaut, Ohio. Filed Nov. 9, 1911. Serial No. 659,361. (Cl. 25-111.)

1,122,977. MOLD FOR CONCRETE CONSTRUCTION. Marvin H. Mooney, Trenton, Mo. Filed Sept. 5, 1911. Serial No. 647,498. (Cl. 25-128.)

1,123,087. COLLAPSIBLE WAGON BODY. James A. Brown, Annona, Tex. Filed Dec. 13, 1913. Serial No. 806,534. (Cl. 21-7.)

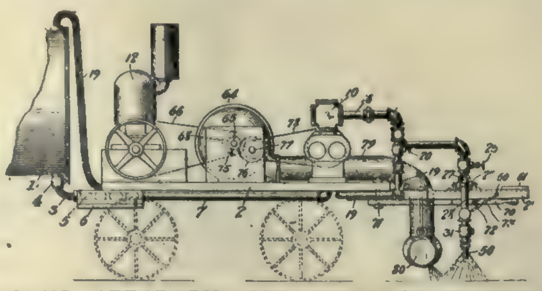
1,123,222. DRIER FOR ORES, SAND, ETC. Bernard R. Behnke and Vernon Keech, Mount Iron, Minn. Filed Sept. 3, 1913. Serial No. 787,901. (Cl. 34-6.)

1,123,746. STREET SPRINKLING DEVICE. Jewell Howard, Amarillo, Tex., assignor of one-fourth to John J. Crume and one-fourth to Robert S. Killough, Amarillo, Tex. Filed Apr. 16, 1914. Serial No. 832,247. (Cl. 137-65.)

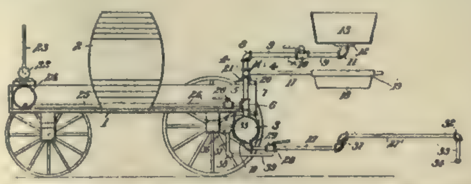
1,123,925. TRAFFIC GUIDE. Roderick W. Roderick, Akron, Ohio. Filed Jan. 27, 1914. Serial No. 814,635. (Cl. 177-337.)

1,124,284. CONCRETE CULVERT. Nelson Brown, La Farge, Wis. Filed May 8, 1914. Serial No. 837,178. (Cl. 72-52.)

1,124,356. BASCULE BRIDGE. Joseph B. Srauss, Chicago, Ill., assignor to The Strauss Bascule & Concrete Bridge Co., Chicago, Ill., a corporation of Illinois. Filed Feb. 19, 1906. Serial No. 301,773. (Cl. 14-35.)

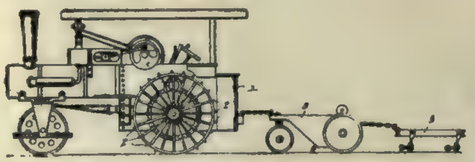


1,124,407. APPARATUS FOR TREATING ROADWAYS. Sam Everett Finley, Atlanta, Ga. Filed Apr. 5, 1913. Serial No. 759,044. (Cl. 137-63.)



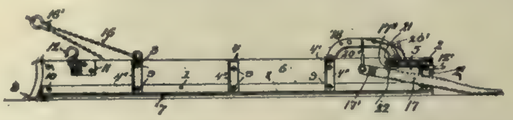
1,124,604. APPARATUS FOR APPLYING BINDER TO ROADWAYS. William H. Gailor, Saratoga Springs, N. Y. Filed Apr. 20, 1914. Serial No. 833,129. (Cl. 137-63.)

1,124,625. ROAD MACHINE. John M. Larsh, Indianapolis, Ind., assignor to American Highway Supply Co., Terre Haute, Ind., a corporation of Indiana. Filed Dec. 18, 1913. Serial No. 807,420. (Cl. 37-7.)



1,124,847. APPARATUS FOR BUILDING ROADS. Thomas Brewer, Homestead, Fla. Filed Aug. 5, 1913. Serial No. 783,104. (Cl. 94-6.)

1,124,922. LIFT BRIDGE. Carl Gustaf Emil Larsson, North Plainfield, N. J. Filed June 24, 1908. Serial No. 440,138. (Cl. 14-36.)



1,126,001. ROAD WORKING MACHINE. Christopher S. Gald, Soldiers Grove, Wis. Filed Nov. 1, 1913. Serial No. 798,651. (Cl. 37-5.)

1,126,487. CONCRETE MIXER. Philip A. Koehring, Milwaukee, Wis., assignor to Koehring Machine Co., Milwaukee, Wis. Filed Sept. 8, 1913. Serial No. 788,730. (Cl. 83-73.)

NEWS NOTES

Road Bonds to the Amount of $500,000, Issued by Hillsboro County, Florida, have been purchased by Otto Marx & Co., of Birmingham, Ala.

The County Commissioners of Jefferson County, Texas, have voted a bond issue of $200,000 for the construction and improvement of roads, the action being taken under the authority of a special road act which is effective in the county. The decision of the commissioners is said to have been made because of complaints about the condition of some of the roads in the county.

The Construction of Something Over Four Miles of Concrete Pavement is planned for next season in Sheboygan, Wis. It is stated that this equals about two-thirds of the entire number of miles of concrete paving laid in the city since 1910. According to present plans, concrete will be used for paving a number of streets, including North 2nd, North 9th, South 7th, South 9th, North 4th and South 14th Sts., and Clara, Erie and Bluff Aves.

GOOD ROADS

A Weekly Journal of Road and Street Engineering and Contracting

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New Series, Vol. IX.

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Number 7

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The Annual Meeting of the American Road Builders' Association

The annual meeting of the American Road Builders' Association was held at the Hotel Astor, New York, N. Y., Friday, February 5. The business of the meeting included, besides the election of officers, the reception of the annual reports of the Secretary, the Treasurer and the Executive Committee, the reception of the report of the Committee on Standards and the report of the Committee on Legislation, and a discussion of various matters relative to the activities of the association. The meeting was preceded by a meeting of the Board of Directors.

The report of the Executive Committee showed a very substantial gain in membership during the year and a most satisfactory financial condition. It also stated that the registration at the eleventh annual convention held at Chicago in December of last year showed a larger attendance than at any previous meeting of the organization, and it was added that the attendance was believed to have been the largest gathering of those interested in road building ever held. Reference was also made to the exhibition of machinery and materials held in conjunction with the convention, which, according to the report, occupied more space than any other exhibition of the kind.

In accordance with the action taken at the Chicago convention when the Committee on Standards and the Committee on Legislation presented progress reports, these two committees reported at the annual meeting. It was voted that their reports be accepted and printed in the annual "Proceedings," for discussion and further action.

Late in the afternoon a recess was taken and at 6:30 those in attendance at the meeting and others who had been unable to be present at the afternoon session gathered at Rector's for dinner. After dinner the meeting was called to order again, the report of the tellers received and brief addresses made by W. A. McLean, the retiring President, who acted as toastmaster; the newly elected President, George W. Tillson; Past President James H. MacDonald, formerly State Highway Commissioner of Connecticut; H. M. Swetland, President of the Class Journal Co., New York, N. Y.; William H. Connell, Chief of the Bureau of Highways and Street Cleaning, Philadelphia, Pa.; R. A. Meeker, State Highway Engineer of New Jersey, and Frank D. Lyon, Secretary of the Inter-State Stone Manufacturers Association, Columbus, Ohio.

The officers elected for 1915 are as follows: President, George W. Tillson, Consulting Engineer to the President of the Borough of Brooklyn, New York, N. Y.; First Vice President, A. W. Dean, Chief Engineer of the Massachusetts Highway Commission; Second Vice President, Austin B. Fletcher, State Highway Engineer of California; Third Vice President, S. Percy Hooker, State Superintendent of Highways of New Hampshire; Secretary, E. L. Powers, Editor, "Good Roads," New York, N. Y.; Treasurer, Major W. W. Crosby, Consulting Engineer, Baltimore, Md.

Directors for three years were elected as follows: E. A. Fisher, City Engineer of Rochester, N. Y.; A. R. Hirst, State Highway Engineer of Wisconsin; Joseph W. Hunter, First Deputy Commissioner, Pennsylvania State Highway Department; Frank F. Rogers, State Highway Commissioner of Michigan; William R. Smith, General Manager of the Lane Construction Corporation, Meriden, Conn., and H. M. Waite, City Manager of Dayton, Ohio.

A Bill to Establish a State Highway Department in Texas

A bill creating a state highway department and providing funds for its work has been introduced in the Texas Legislature.

The bill provides for the appointment of a highway commission of three members, who are to serve without salary but may be allowed traveling expenses and $10 a day while in the performance of their duties. The law provides that the highway commission shall elect a state highway engineer at a salary not exceeding $4,000 a year, to hold office during the pleasure of the commission. The state highway engineer may appoint assistant engineers, clerks and other necessary assistants, with the advice and consent of the commission.

It is provided that the state highway commission and the state engineer shall constitute the state highway department. It is also provided that the state highway commission shall effect its own organization, establishing such rules as may be necessary; that it shall hold regular quarterly meetings, and that special meetings may be called by the chairman or by a majority of the commission.

The duties of the commission, as outlined in the bill, are to consider all questions relating to the general policy and to the work of the state highway department; to receive and consider the reports of the state highway engineer, and to act for the state highway department in all matters submitted to the governor or the legislature. It is provided that the state highway engineer shall act as secretary of the commission; keep all records of the department; collect information and compile statistics relative to the roads; investigate methods of construction and determine those best adapted to the various sections of the state; establish standards for construction and maintenance; and act in an advisory capacity to county or city officials, and perform other similar duties. He must submit to the state highway commission a quarterly report and an annual report and also a complete biennial report, the latter for transmission, with the recommendations of the commission, to the legislature.

The bill provides that the state highway department may maintain a laboratory for the analysis and testing of road material and that it may build demonstration roads.

Funds for carrying on the work of the department are to be obtained from motor vehicle licenses, which are fixed at $1 for each motorcycle and $3 for each other motor vehicle. The collection of this fee and the issuing of licenses and license plates is vested in the department. It is provided, however, that one-third of the gross collections made by the highway department in motor vehicle fees shall be returned to the counties wherein collected, to be expended by the counties in the maintenance of their public highways. The bill also carries an appropriation of $10,000 out of the general revenues of the state to defray the expenses of the state highway commission until October 1, 1916, when the motor vehicle funds become available.

A Good Roads Week at Cornell University

A "Good Roads Week" is to be held under the auspices of the College of Civil Engineering of Cornell University, at Ithaca, N. Y., February 15 to 20.

According to the announcement, the program of the week will include a series of lectures on highway work, demonstrations of the testing apparatus in the college laboratory and discussions on various phases of road work. The New York State Highway Department and the United States Office of Public Roads are to cooperate in the meeting.

Highway Appropriations by Massachusetts Towns

The following appropriations for highway and bridge work have been made by Massachusetts towns at recent town meetings:

Brimfield, $2,141.11; Buckland, $3,200; Charlemont, $2,000; Cheshire, $1,900; East Longmeadow, $3,000; Enfield, $1,500; Harvard, $3,000; Hinsdale, $2,290; Huntington, $2,700; Mattapoissett, $1,000; Northfield, $5,624.74; Northampton, $2,500; Peru, $1,100; Princeton, $4,000; Richmond, $2,500; Savoy, $1,500; Shutesbury, $1,200; Stockbridge, $15,000; Sunderland, $600; West Stockbridge, $1,500; Whately, $2,000; Wilbraham, $2,500; Worthington, $2,500.

An Investigation of Prison Labor on the Highways

An investigation of the subject of road work for misdemeanant prisoners has recently been undertaken under the joint direction of the National Committee on Prisons and Prison Labor and the Graduate Highway Engineering Department of Columbia University.

It is stated that the investigation will be nation-wide in its scope, although the different sections of the country will be considered separately. Attention is to be given to such factors as the most economical size of gang; the cost of guarding, housing and feeding, and of necessary stock; the practicability of grading the men for labor; the value of the work, and the possibilities of the plan when wages and other incentives increase efficiency. It is the hope of the National Committee on Prisons and Prison Labor that as a result of this investigation accurate information will be obtained which will go far toward insuring the successful development of prison labor wherever it is undertaken.

The investigation is in charge of James Leland Stanford, Jun.M.Am.Soc.C.E., who has had considerable experience with the use of convict labor in Georgia, where many of the male prisoners are employed on the highways.

NEWS NOTES

A Bond Issue of $100,000 for road purposes has been voted in Alexandria, La.

The Perry County Good Roads Association Has Been Organized in Perry County, Ala. W. L. Pitts has been elected President; Dr. S. A. Gordon, Vice President; J. V. Woodfin, Secretary, and A. R. Armstrong, Treasurer.

Road Bonds to the Amount of $500,000 have recently been voted in three Kentucky counties. The counties and the amounts voted are as follows: Carter, $150,000; Lewis, $150,000, and Greenup $200,000.

The Issuing of Road Bonds to the Amount of $300,000 is to be voted upon in Ballard County, Kentucky, on Feb. 27, the County Court having recently ordered the submission of the question to the voters. According to reports the issue is likely to carry.

An Election on the Question of Issuing $125,000 in Bonds is under consideration in Nicholas County, Kentucky, where petitions have been circulated asking for an election on March 28. It is proposed to use the proceeds of the bonds for the reconstruction of the turnpikes of the county.

A Paducah and McCracken County Chapter of the Kentucky Good Roads Association was formed recently at the annual banquet of the Paducah Retail Merchant's Association, held at Paducah, Ky. State Commissioner of Public Roads Robert C. Terrell of Kentucky was one of the speakers. B. Weille was elected President and W. Cochran, Secretary.

The Village of Bolivar, N. Y., voted at a recent special election, for the expenditure of $36,000 for paving. The funds will be used for the construction of a pavement 1½ miles long, extending from one corporation line to the other. The work will be done under state supervision, the cost being paid by the village, the abutting property owners and the county.

The Expenditure of the Ohio State Highway Department for 1915 will be about $5,000,000 according to a recent statement by State Highway Commissioner James R. Marker. The amount spent last year was $7,000,000. It is stated that the reduction is due mainly to the smaller road levy. At the last special legislative session the rate was reduced from .5 mill to .3 mill.

The Proposed Extension of Market St., San Francisco, Cal., will cost $350,000, according to a recent estimate by City Engineer O'Shaughnessy. The tentative plans for this work provide for extending Market St., from 17th and Castro Sts. over the Twin Peaks tunnel bore to Portola Drive. This will connect the city's principal commercial thoroughfare with the boulevard system and the highways extending down the peninsula.

COMING MEETINGS

February 15-16.—National Paving Brick Manufacturers' Association.—Convention, Hotel Statler, Detroit, Mich. Secretary, Will P. Blair, Engineers Bldg., Cleveland, Ohio.

March 9-12.—Michigan Good Roads Association.—Seventh Annual Convention, Grand Rapids, Mich. Secretary, A. A. Anderson, Hastings, Mich.

March 22-26.—Dominion Good Roads Association and Ontario Good Roads Association.—Second Canadian and International Good Roads Convention, Convocation Hall, Toronto, Ontario, Canada. Secretary-Treasurer, George A. McNamee, 909 New Birks Bldg., Montreal, P. Q., Canada.

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State Aid in Kentucky

According to recent advices from Frankfort, Ky., thirty-three counties of the state have made application for aid in the construction of highways during the coming year.

Of these counties seven have asked for the maximum amount of state aid, which amounts to $12,000 each. These are Boyd, Campbell, Franklin, Johnson, Larue, Mercer and Trimble. The other counties which have applied for aid are Barren, Boone, Bourbon, Daviess, Grant, Graves, Harrison, Hart, Henry, Hopkins, Jefferson, Jessamine, Logan, McCracken, Madison, Nicholas, Ohio, Pulaski, Rockcastle, Russell, Shelby, Simpson, Todd, Warren and Woodford.

Good Roads Institute at the University of North Carolina

A good roads institute is to be held at the University of North Carolina, Chapel Hill, N. C., on February 23-26.

In the arrangement of the program, certain subjects have been designated for consideration at the different sessions. The subjects and the times at which they will be taken up are as follows: "Location, Design and Construction of Roads," Tuesday afternoon, Feb. 23; "Sand-Clay, Topsoil and Gravel Roads," Wednesday forenoon, Feb. 24; "Macadam Roads," Wednesday afternoon, Feb. 24; "Maintenance of Roads," Thursday forenoon, Feb. 25; "Bridges and Culverts," Thursday afternoon, Feb. 25.

In addition, various other subjects will be taken up, among them inspection, blasting, the use of convict labor, etc. Friday, Feb. 26, will be devoted to a consideration of blasting materials of different kinds, to the subject of the relations between the various authorities concerned in highway work, and the subject of the use of convict labor.

Additional Appropriations for Road Work by Massachusetts Towns

In the issue of February 13 there was printed a list of appropriations for highway and bridge work made by various towns in Massachusetts. In addition to those noted last week, appropriations have been made as follows:

Amherst, $1,335; Ayer, $2,000; Belchertown, $4,000; Dalton, $4,000; Hawley, $1,600; Leicester, $3,000; Monson, $1,000; Monterey, $800; Palmer, $21,500; Wales, $1,000; Ware, $8,000, and Williamstown, $9,000.

Proposed Street Work in Butte, Montana

According to a recent statement by City Engineer Flood of Butte, Mont., improvement work to be undertaken by the city during 1915 will cost $383,500, a large part of which is to be expended for street work.

Included in the proposed work are the paving of Arizona St., from Platinum St. to the Great Northern right of way, at a cost of $48,000; the paving of Front St., between Utah and Harrison Aves., at a cost of $15,000, and grading and the construction of sidewalks in the Farrell addition at a cost of $10,000. In addition to these, there is uncompleted work consisting of grading and the construction of sidewalks which is to be completed during the year.

The $383,500 worth of work does not include the proposed paving of Wyoming St., between Mercury and Front Sts., for which no estimates have yet been made.

Highway Legislation in Texas

Several bills relating to road work are now pending in the Texas Legislature. One of these, known as the Tillotson bill, which was introduced in the House, was noted in the issue of last week.

In addition to this bill, there are two others which have been introduced in the Senate and have been reported favorably by the Committee on Roads, Bridges and Ferries. One of these was introduced by Senator Darwin and the other by Senators McGregor and Henderson.

The Darwin bill is very similar to the Tillotson bill outlined in the issue of last week. The bill by Senators McGregor and Henderson is an administration measure and deals largely with the state penal system. It provides for the creation of a state trunk highway department, to be a part of the prison system of the state, the Board of Prison Commissioners being made ex-officio state highway commissioners. The bill provides for the construction, maintenance and control by the state of a system of trunk highways to be built principally by convict labor. It also provides for the appointment of a competent engineer, with not more than two assistants, and specifies 17 trunk highways having a total mileage of 2,713. Funds for the carrying out of the work proposed in the bill are to be secured from automobile license fees.

According to reports it is probable that the Legislature will enact some law for the extension and improvement of the highway system of the state. While the three bills which have been mentioned conflict in some of their features, it is thought that they may eventually be combined.

Street Paving in Springfield, Ohio, in 1914

Of the 163.76 miles of streets in the city of Springfield, Ohio, 101.64 miles are classed as improved and 62.12 miles as unimproved, according to the recent annual report of Chief Engineer M. J. Bahin to City Manager Ashburner.

During 1914 parts of 11 streets were paved, at a total cost of $157,319.28, the total area involved being 78,476 sq. yds. In addition, there were under construction at the close of the year six other paving projects having a total area of 27,100 sq. yds., which, when completed, will cost $68,484.83. The average cost of pavements, including excavation, was $1.85 per sq. yd. for brick, $1.97 per sq. yd. for sheet asphalt, and $1.73 for asphaltic concrete.

Besides paving work, the city laid 17,660 sq. yds, of macadam at a cost of $11,317.77 and graveled 1,756 sq. yds. of streets. During the year, 107,009 sq. ft. of cement sidewalk was built, and 14,488 lin. ft. of cement curbs and gutters were laid.

The total cost of street cleaning for the year was $24,897.72. The 42,000 sq. yds. of pavement in the business area was swept and flushed daily at an average cost of 96 cts. per 1,000 sq. yds., while the 509,000 sq. yds. of paving in the residence districts was swept twice a week and the sweepings carted away at an average cost of 51 cts. per 1,000 sq. yds.

A Bill to Establish a State Highway Commission in North Carolina

A bill providing for the establishment of a state highway commission has been introduced in the Legislature of North Carolina, and has been reported favorably by the House committee.

The bill provides for the establishment of a state highway commission consisting of the Governor, three citizens of the state appointed by the Governor, the State Geologist, a professor of civil engineering from the University of North Carolina, and a professor of civil engineering from the North Carolina Agricultural and Mechanical College, these two professors to be designated by the Governor. The bill also provides that the commission shall appoint a civil engineer to be the state highway engineer, and such other assistants as may be required. The duties of the state highway engineer, as outlined in the bill, are to comprise the giving of advice to local officials, the providing of surveys, plans, specifications and estimates for road work, the oversight of road and bridge work in the state and the keeping of the records of his office. The term of the commission is four years and that of the state highway engineer six years. No salary is provided for the state highway commission, and the fixing of the salary of the state highway engineer is left to the commission.

The bill carries an annual appropriation of $30,000 for carrying out its provisions.

NEWS NOTES

The City Officials of Tulare, Cal., have awarded a contract for the paving of 17 blocks in the city to the Federal Construction Co., of San Francisco, at $90,494.

The Amount of Paving Work to be Done in Topeka, Kan., during the present year will, according to present estimates, be about one-half as much as was done in 1914. Last year 63 blocks were paved.

The Paving of Four Miles of Streets in Palo Alto, Cal., is proposed for the present year. At present there are about 80 miles of streets within the city limits, and with the completion of the proposed work nearly 50 per cent. of the streets will be improved.

A Contract to Lay 100,000 sq. yds. of Asphaltic Concrete has recently been awarded by the city of Forth Worth, Tex., to the Roach & Manigan Paving Co., of Memphis, Tenn. The streets to be paved are in the packing house district of Fort Worth, and the total cost will be $235,000. One year from the date of contract is allowed for the completion of the work.

Road and Bridge Work in Polk County, Iowa, during 1914 cost $187,379.09, according to the annual report of County Engineer H. G. Curtis. Of the total amount, $139,261.17 was expended for bridge and culvert work. This included the construction of 78 permanent bridges. The amount spent for road work was used for repairing, grading and dragging, the cost of the latter item being about $4,250.

Statistics on Road Work in Alabama were given in the quarterly report recently submitted by State Highway Engineer W. S. Keller to the State Highway Commission. According to Mr. Keller's report, state aid work, which it is estimated will cost $82,633.34, was commenced during the quarter ending Dec. 31, 1914. During the same period, state aid work was completed in 14 counties of the state. According to a supplementary report submitted with the regular quarterly report, 33 counties in Alabama have engaged in the construction of roads since the first state aid road was built under the supervision of the Highway Department. Of these 33 counties, 13 have issued bonds or interest bearing warrants to provide funds for the work.

Contracts for Paving 25 Streets, a total area of 78,365 sq. yds., have recently been awarded by the Board of Public Works of Tampa, Fla., to the Georgia Engineering Co., of Augusta, Ga., and the Edwards Construction Co., of Tampa, Fla. The former company was awarded contracts for 23 of the streets and the latter for two. The paving will be of brick, with granite curbs, some of the brick to be laid in the usual way and some to be laid flat. The prices bid by the Edwards Construction Co. were $1.74 and $1.85 per sq. yd. for brick laid on edge and 33 cts. and 37½ cts. per lin. ft. for curbing. The prices bid by the Georgia Engineering Co. varied for brick laid on edge from $1.37½ to $1.65 per sq. yd. and for brick laid flat from $1.20½ to $1.46 per sq. yd. That company's price for granite curbing was 35 cts. per lin. ft.

COMING MEETINGS

March 3-5—Manitoba Agricultural College and the Provincial Department of Public Works.—Short Course and Convention on Highway Construction, Manitoba Agricultural College, Winnipeg, Man.

March 9-12.—Michigan Good Roads Association.—Seventh Annual Convention, Grand Rapids, Mich. Secretary, A. A. Anderson, Hastings, Mich.

March 22-26.—Dominion Good Roads Association and Ontario Good Roads Association.—Second Canadian and International Good Roads Convention, Convocation Hall, Toronto, Ontario, Canada. Secretary-Treasurer, George A. McNamee, 909 New Birks Bldg., Montreal, P. Q., Canada.

Short Course and Convention at the Manitoba Agricultural College

A road meeting designated as a "Short Course and Convention on Highway Construction" is to be held at the Manitoba Agricultural College, Winnipeg, Man., on Wednesday, Thursday and Friday, March 3, 4 and 5. There will be sessions on Wednesday afternoon and evening, Thursday forenoon, afternoon and evening, and Friday forenoon and afternoon.

The program for these sessions includes technical papers, addresses and discussions. Among the speakers on the program are State Highway Engineer Thomas H. MacDonald of Iowa; J. H. Mullen, Deputy Engineer of Roads, Minnesota State Highway Commission, and P. P. Sharples, Manager, General Tarvia Department, Barrett Mfg. Co., New York, N. Y.

GOOD ROADS

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NEW YORK, FEBRUARY 27, 1915

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Proposed Paving Work in Topeka, Kansas

Paving work proposed for 1915 in Topeka, Kan., will include the construction of 36½ blocks of street paving and 2½ blocks of alley paving.

According to present plans, asphalt pavements will be laid on portions of Hancock, Fillmore, 7th, Broadmoor and 11th Sts., and College, Willow and Jewell Aves. Brick pavement is to be laid on portions of 7th, Van Buren and 6th Sts., and Ashland and Seward Aves. The longest stretch of pavement will be on Seward Ave., where 9 blocks of brick pavement are to be laid.

Road Funds in Cook County, Illinois

The Board of County Commissioners of Cook County, Illinois, recently passed a resolution authorizing a $2,000,000 bond issue for the construction of roads. Provision for such action was made by vote at the general election in November of last year. The resolution provides for the issuing of $200,000 in bonds each year for 10 years.

Under the present road law of Illinois, the state will appropriate an equal amount, which will give the county $400,000 to be expended for roads during the present year if the courts decide the bond issue to be legal. The present plan, according to reports, is to use the funds from the sale of the bonds for the completion of the concrete roads, the construction of which has been commenced with state aid funds. These roads are the extensions of Milwaukee, Archer and Western Aves. and South Halsted St.

It will be necessary, it is stated, to test the validity of the bond issue in the Supreme Court before it is possible to sell the bonds, and the funds will not be available until some time in August. The bringing of a friendly suit by the Associated Good Roads Organizations of Chicago and Cook County is now contemplated to decide the point upon which the question of the legality of the bond issue depends. This point, according to reports, is whether it was necessary that the proposition to bond the county receive a favorable vote by "a majority of all the votes cast" or a favorable vote by "a majority of the votes cast on the proposition."

Road Material Testing Laboratory at the University of Texas

The Bureau of Economic Geology and Technology of the University of Texas has recently completed its laboratory for testing road materials, building stone and similar materials.

The installation of apparatus in this laboratory has been going on for some time, and it is now equipped with the necessary machines and appliances for carrying on its work. Tests are to be made for citizens of the state without cost to them except the payment of express charges on samples. William B. Phillips, the director of the Bureau, states that as it is likely that at least 95 per cent. of the roads built in Texas will have to be built of gravel, particular attention will be paid to the testing of that material.

The work is under the supervision of Director Phillips and Testing Engineer James P. Nash, formerly of the U. S. Office of Public Roads.

Highway Legislation in Oklahoma

There has been introduced in the Oklahoma Legislature a bill providing for radical changes in the present highway law of the state.

The bill proposes the abolition of the State Highway Department, as now constituted, and transfers all of its powers and duties to the State Board of Public Affairs. This board is given authority to employ a salaried engineer, with whom the civil engineers of the State University and the Agricultural and Mechanical College at Stillwater and the head of the State Geological Survey would act as an advisory board, serving without compensation.

The bill also provides for the division of the public roads into three classes, designated as county, state and township, and makes it mandatory upon the commissioners of each county to designate not less than 10 nor more than 25 per cent. of the roads in the county as state roads. Provision is also made for the utilization of convict labor on roads of all three classes.

The revenue raising provisions of the bill include the levy of a state tax of 50 cts. per horse-power per annum on all motor vehicles, in place of the $1 license fee now charged on automobiles. Other revenues are provided for by a provision that every county must levy a tax of not over 10 mills for the creation of a road and bridge fund and a levy of not less than .4 mill for a special dragging fund. Another portion of the bill provides for a state levy of .25 mill on all taxable property within the state.

Legislative Action Relative to the "Southern National Highway"

The legislatures of several of the Southern States are taking cognizance of the so-called "Southern National Highway" through the adoption of resolutions indorsing it.

The route of the projected highway was designated by a commission, appointed by the governors of the Southern States, which met at Asheville, N. C., in February, 1913. The route as proposed extends from Washington, D. C., through Richmond, Va., Durham, N. C., Knoxville, Nashville and Memphis, Tenn., Little Rock and Hot Springs, Ark., Dallas, Fort Worth and Sweetwater, Tex., Roswell and Mescalero, N. M., El Paso, Tex., and Clifton, Phoenix and Yuma, Ariz., to San Diego, Cal.

Early this month the Legislature of North Carolina adopted resolutions commending to the states traversed by the route further action in its improvement. The resolution also sought the cooperation of the other states in requesting the federal government, in its proposed legislation, to designate the road as the "Southern National Highway" and to cooperate with the states in its establishment and maintenance. These resolutions were transmitted to the seven other states interested in the proposed highway, and recently the Legislature of Texas has indorsed the proposition, this action being taken at the request of Governor Ferguson.

According to the resolution adopted by the North Carolina Legislature, the road is "almost completed" from Washington, D. C., to Knoxville, Tenn., and is an "open and usable" road from Dallas, Tex., to San Diego, Cal., while much of the intervening portion has been improved.

Work of the Pennsylvania State Highway Department

According to a report of the Pennsylvania State Highway Department for the period from June 1, 1913, to June 1, 1914, which has recently been issued, the total of the departmental expenditures for that period was $4,708,652.14. In addition, there was expended a total of $117,340.03, divided as follows: Automobile registry division, $88,132.13; township road fund, $9,982.05; turnpike purchase fund, $19,225.85.

The items making up the total of the "department expenditures" were as shown in the following table:

Payments on Contracts:		
State aid roads, act 1909	$162,469.21	
State aid roads, act 1911	653,685.06	
National or Cumberland Road	107,830.09	
State highway route contracts	1,079,125.05	
		$2,003,109.41
Engineering and Inspection:		
State aid road contracts, act 1909	$7,414.43	
State aid road contracts, act 1911	63,390.99	
State highway route contracts	50,915.09	
National or Cumberland Road	2,170.04	
		$123,890.55
Surveying and Plotting State Highway Routes		$81,877.08
Surveying and Plotting County Maps		103,240.32
Advertising Expense		7,896.59
Maintenance:		
State highway routes	$1,682,362.63	
State aid roads	132,428.81	
Machinery, tools and equipment	242,035.67	
		$2,056,827.11
Experimental Work		$12,365.24
Signs and Sign Posts		9,536.29
Damages, Account of Change of Line		498.00
General Expense, State Highway Department		309,411.55
Total Department Expenditures, June 1, 1913, to June 1, 1914		$4,708,652.14

Paving Contracts Awarded in Portersville, California

A large paving contract has recently been awarded by the city officials of Portersville, Cal.

The work comprises the paving of about 33 blocks of city streets, and will cost approximately $60,000. The pavement will consist of a 1½-in. Topeka specification wearing surface on a 5-in. concrete foundation.

At the time the contract was awarded, it was stated by city officials that as a result of the very low price which was obtained it was probable that about one dozen additional blocks of paving would be laid by private contract.

Street Work in Austin, Texas, in 1914

According to the annual report of City Engineer M. C. Welborn, of Austin, Tex., more street paving was done in Austin last year than was done in the city during the entire period up to the inauguration of the commission form of government.

The report shows that Austin has about 52,000 lin. ft., or something less than 10 miles, of paved streets and alleys. The total amount paved in 1914 amounted to 10,797.7 lin. ft., while at the time the commission form of government was adopted the total amount of paving in the city was 7,733 lin. ft. The total mileage of streets in the city is 276.23. Proposed street paving work will bring the total of paved streets up to about 10½ miles. When this is completed, there will be about 8 miles of bitulithic, the remaining 2½ miles being brick, concrete and wood block.

NEWS NOTES

A Road Bond Issue of $250,000 has recently been voted in Bell County, Kentucky. The work to be done under the issue is to be started in the early spring and completed by the end of the year.

A Contract for the Construction of State Rural Road No. 32 in Beltrami County, Minnesota, has recently been awarded to Dahl & Co., of Duluth, Minn. The road will be graded and surfaced with gravel, and it is estimated that the total cost of the work will be something over $100,000.

The Paving of a Portion of 15th St. in Denver, Colo., at a Cost of about $90,000, is to be undertaken this season, according to reports. The portion to be repaved extends from Larimer St. to Broadway, and the work will be the largest single undertaking of the kind in the city during the present year. Of the total cost, the city will bear approximately $50,000, while the remainder will be paid by the street railway company.

Necessary Improvement Work in Frederick, Md., as outlined by City Engineer E. C. Crum at a recent meeting of the Board of Aldermen, will cost about $33,000. The work includes the following street work: The construction of concrete curbs and gutters on portions of Patrick, Church, Bentz, 2nd and other streets, $1,561.80; grading and macadamizing portions of Center, Madison and Burck Sts., $4,477.50; constructing concrete paving, curbs and gutters on Market Space, $2,497.50; laying Amiesite paving on a portion of 2nd St., $2,700; resurfacing portions of 4th St., $7,605.

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March 24-25.—Florida State Good Roads Association.—Annual Convention, St. Petersburg, Fla. Secretary, J. P. Clarkson, Jacksonville, Fla.

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SELECTING THE TYPE OF PAVEMENT

At various times in the past we have devoted space in these columns to the matter of the selection of pavements, discussing the question of how the engineer should attack the problem. For the purpose of these discussions it has been assumed that the duty of making the selection devolved upon the engineer, as it should. It is unfortunate, however, that this is not always the case and that too often the choice of the pavement to put down on a given street lies with the abutting property owners or other laymen. This regrettable state of affairs has been brought to notice recently, partly through news items relative to the making of such selections by property owners and partly by a lecture delivered at the recent road school at the University of Ohio by Professor Leonard S. Smith of the University of Wisconsin.

As Professor Smith pointed out, the custom of allowing the owner of abutting property to decide the type of pavement to be put down in the adjacent highway is wrong in theory and in practice. Probably it is not necessary to look very far for the reason for this custom. There are many ways in which city and town officials can get into disfavor because of their official actions, and it is perhaps not strange that in a matter so full of opportunities to displease their constituents as is the selection of the type of pavement to be laid in the streets adjacent to their property, the burden of such selection should be shifted to the shoulders of the property owners. In other words, the underlying cause of this evil is political, and although a change which will shift the responsibility for selecting the pavements to the engineering department of the city—where it properly belongs—may not be politically wise, it is necessary if pavements are to be selected in accordance with business and engineering principles.

In concluding the portion of his lecture dealing with the selection of pavements, Professor Smith stated that he did not intend to "belittle the thorough-going and bona fide investigations of pavement matters by citizen organizations," and argued that "under our democratic form of government such movements are a real necessity for informing the general public and thereby securing its confidence and cooperation with the plans of the city government."

While we believe that such investigations often indicate commendable public spirit and that they frequently accomplish more in the way of educating the public than could be accomplished by a body of engineers, it is not certain that lay investigations are necessary or even desirable from the standpoint of the results achieved or the economy of the method employed. As Professor Smith pointed out in his lecture, the best results from such an investigation are realized through the employment of experts to investigate and report. This immediately suggests that it would be as well for the city to employ the experts and that, in all probability, the city authorities, guided by the city engineer, would make a wiser selection of experts than would the committee of citizens. As a matter of fact, the work of such citizen committees is generally carried out in about the same way. The committee either turns the entire matter over to an expert of its own choosing or attempts to solve the problem itself by investigations of its own.

As pointed out, nothing is gained by the first plan, if, indeed, there is not an actual loss. If the committee undertakes to work under the second plan, it usually goes to other communities on inspection junkets, interviews city officials, engineers and others, all at the expense of the city, and is often entertained by salesmen at the expense of paving companies. As a result of its "investigations" it reports back, making recommendations which are frequently valueless, either because they are made by those who have not the requisite qualifications to draw conclusions from what they have observed or because the conclusions are more or less influenced by outsiders who are prejudiced in favor of some particular pavement.

There can be no question that the selection of a pavement for a given highway is a problem calling for special knowledge. It is equally certain that the knowledge called for is engineering knowledge. Granting these premises, it would seem evident that the problem is one for the engineer just as surely as the treatment of disease is a matter for the physician or the settlement of a question of law is one for lawyers. It follows, then, that the selection of pavements for a municipality should be left to the engineering department, with or without consultation with specialists, depending upon the complexity of the particular case.

SPRING WORK ON THE EARTH ROADS

Within a very short time the frost will be out of the ground throughout a very large area in the northern portion of the country. When it comes out it will leave a majority of the earth roads in a rough, badly rutted condition, and in most communities some attempt will be made to "work" the roads. Since the earth road is the prevailing type on a very large percentage of the total road mileage of the United States, the manner in which this work is done is a matter of the greatest importance.

There are many ways of performing spring work on the earth road. One of these, and, unfortunately, one of the most common, is to wait until the road has thoroughly dried out and then go over it with a road machine, scraping out the ditches and bringing to the center of the traveled track leaves, sods, twigs, roots, stones and all the debris which has accumulated there since the last "working." That this method of using one of the most valuable of machines is entirely wrong should be patent to anyone having the most elementary knowledge of road construction and maintenance, for one of the first principles of the road builder's art is to keep such material as far away as possible from the surface of the road. Yet it is a fact that exactly the method described is in very common use in many places.

The road machine, more definitely described as a road grader or scraping grader, is a very useful machine, and one which can be used to advantage on the earth road for cleaning out the gutters and for regulating the surface of the traveled track when that surface is so uneven as to require such treatment. It is not being used to advantage, however, when it is employed in the manner referred to in the preceding paragraph—rather is it being abused. Nor is it the only machine or appliance necessary for the maintenance of the earth road.

An appliance that has found extensive use and that, when used intelligently, has invariably given satisfaction, is the road drag. This appliance may be made from a log or a piece of heavy timber, or may be purchased at a small cost from a number of manufacturers under the name of drag, hone or leveler. In popular articles upon the use of the drag it is commonly referred to as the "split-log," the "King" or the "King split-log" drag, for the reason that the implement was brought to public notice largely by a Missourian named D. Ward King, who manufactured a home-made contrivance from a log which he split in two and used for the two blades or scrapers of the drag. Popular literature is also apt to carry the idea, by implication at least, that the excellence of this apparatus is due largely to the fact that it is homemade. This, of courses, is a fallacy, for there is no doubt that the various well made drags on the market are quite as efficacious as the homemade affair, if not more so; and it is certain that they are much more durable, and therefore, probably as cheap in the long run.

The road drag, used at almost any time when the road surface is wet, will smooth the surface by scraping off the ridges and depositing the material therefrom in the ruts. By operating it in such a manner as to give the road the necessary crown it is possible to provide for the quick drying out of the road after a rain by the shedding of the water to the ditches, which should, of course, be cleaned out and deepened when necessary. The drags may be operated by farmers living along the road, with whom the township authorities can often make contracts to do the work for comparatively small compensation. This plan has been followed in many places, with very satisfactory results. It is also feasible to use automobiles to haul the drags, a plan which has also been tried and found satisfactory.

The primary requisite in the maintenance of earth roads is to keep them dry, and to do this the water must be kept off the road and out of the road. The first can be done by keeping the surface smooth enough and sufficiently crowned to shed the rain water to the ditches. The second can be accomplished by providing ample side drainage and efficient underdrainage. The side drainage can be cared for properly by ample ditches and culverts, the whole object of the drainage system being to get the water as far away from the road as possible, as quickly as possible. This is also the object of underdrainage. This, of course, should be taken care of when the road is built, by using a foundation that dries out quickly, when possible, or by installing drains under the roadway. In many cases in which proper provisions for underdrainage were not made when the road was built, it would be possible and economical to build underdrains in some of the places where they are found to be most necessary after the road has been built and in use for some time. Such bad spots in the roads can readily be located in the spring of the year, as they will be the last to dry out.

The work that is done in the spring will very largely determine the character of the earth road during the summer to come, and too much care can not be taken in its performance.

Grants by the British Road Board

During October, November and December of last year the British Road Board indicated additional advances to highway authorities amounting to £170,935. Of this amount, £132,843 was in grants and £38,092 in loans.

The advances made and indicated up to Dec. 31, 1914, less indications cancelled, amounted to £5,954,304, of which £4,508,585 was in grants and £1,445,719 was in loans.

Grants completed with the approval of the Treasury during October, November and December were as follows:

Road crust improvements	£219,774
Road widenings and improvements of curves and corners	80,994
Road diversions	6,134
Reconstruction and improvement of bridges	4,620
New roads and bridges	26,467
Total	£337,989

Among those who gave lectures before the graduate stu-

A Bond Election in Nicholas County, Kentucky, will be held on March 17, when the electors will decide whether or not the county shall bond itself for $125,000 for road work. The original petition for a bond election requested that it be held on March 28, as was noted in "Good Roads" for Feb. 13.

Methods and Cost of Road Work in District Number Two of Lowndes County, Mississippi

In May, 1913, a bond issue of $50,000 was voted in District No. 2 of Lowndes County, Mississippi. During the next month the bonds were sold to local investors and shortly afterward work was commenced on the improvement of about 20½ miles of road. The work was done under the supervision of Charles Lyon Wood, Engineer for the district, to whom we are indebted for the following information and for the accompanying illustrations.

Lowndes County is situated on the eastern border of Mississippi, a little north of the center. District No. 2 is the smallest road district in the county and contains the city of Columbus, the county seat, which is situated near its western border. Columbus has a population of about 12,000 and an assessed property valuation of approximately $3,500,000. As the entire district, including the city, has an assessed valuation of about $4,500,000, the city pays approximately 75 per cent. of the taxes.

VIEW ON THE ROBINSON-GILMER ROAD, LOWNDES COUNTY, MISSISSIPPI. CLAY-GRAVEL ROADWAY, 14 FT. WIDE; GRADED TO A WIDTH OF 22 FT.

The county is divided into two portions, the Tombigbee River being, roughly, the dividing line. East of the river the soil is a sandy loam over a clay sub-soil. The land rises by successive terraces from the river to the hills in the northeast, the elevation varying from about 200 to about 300 ft. above sea level. There are large deposits of sand-gravel suitable for concrete aggregate and smaller deposits of clay-gravel suitable for road building. For several years the county authorities have used the latter material for road work, buying it in banks conveniently located near the main roads and at prices so low as to make its cost practically no more than the cost of digging and hauling to the work.

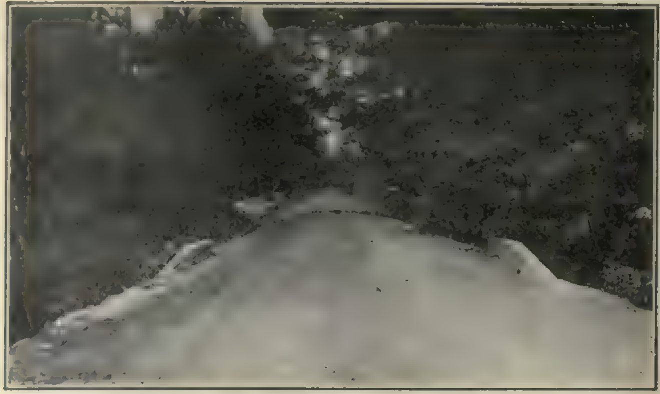
The land to the west of the river is high and rolling, the soil being a black prairie soil underlaid by strata of limestone. This rock makes excellent lime, but is too soft for road surfacing, so that road building materials have to be imported, making the cost of road work in the western section some 50 per cent. greater than in the eastern part of the county, in which District No. 2 is situated.

Under the laws of Mississippi road districts may be created by the boards of county supervisors upon petition of a certain number of qualified electors, and after certain forms have been complied with. A road district may issue bonds up to 10 per cent. of the assessed valuation of all real and personal property within the district. The work of road construction and maintenance is carried out by three commissioners appointed by the supervisors. These commissioners must be residents of the district and must be electors and owners of real estate. They serve for four years and receive no salary, but are allowed expenses up to a fixed limit. The commissioners recommend the amount of the bond issue, select the roads to be improved and employ an engineer to have direct supervision of the work. All money expended is paid out on the commissioners' certificates and they are empowered to purchase machinery and teams and to employ a competent overseer and sufficient labor to maintain the roads. A maintenance tax of not over one mill is levied for this work.

The work under the $50,000 bond issue of District No. 2 was done under the direction of Commissioners D. D. Stephenson, President, T. O. Burris, and W. C. Gunter, Secretary. As has been noted, C. L. Wood was the engineer in charge. The contractors were R. C. Searcy & Co., of Greenville, Ala. The accompanying tables contain the details of the work, including quantities and total and unit prices. The work was commenced in September, 1913, and completed in August, 1914.

In order to encourage road improvement in adjoining districts and benefit the trade of Columbus, the commissioners

REINFORCED CONCRETE CULVERT OF THE TYPE INSTALLED IN THE LOWNDES COUNTY WORK.



VIEW OF TYPICAL CULVERT FROM ROAD—OLD MILITARY ROAD, LOWNDES COUNTY, MISS.

took advantage of a statute permitting any road district to extend its roads into adjoining districts, and built about nine miles of road in Districts Nos. 3 and 5, as shown in one of the tables.

The total amount paid to the contractors was $46,373.30, as shown by the table. Engineer Wood's estimate of the cost, included in a report to the commissioners made in June, 1913, was $46,255.05. To the total cost, $46,373.30, should be added an item of $1,733.52 for culvert pipe furnished by the commission, making the total cost of the actual con-

SUMMARY OF QUANTITIES AND PRICES; ROAD WORK BY SUPERVISOR'S DISTRICT NO. 2, LOWNDES COUNTY, MISS.

Road	Military	Wolfe	Aberdeen	Pickensville	Air Line	Robinson-Gilmer	Totals
District	No. 2	No. 2	No. 2	No. 3	No. 3	No. 5	
Miles graded	4.84	1.83	4.62	4.03	0.39	4.92	20.63
Miles graveled	4.84	1.83	0.70	4.03	0.39	4.92	16.71
Width of roadbed (ft.)	20	20	20	20	20	22 to Sta. 135 20 from Sta 135 to Sta. 265	....
Width surfaced (ft.)	14	12	14	14	14	14	....
Surfacing material*	Clay gravel	Clay gravel	Clay gravel	Clay gravel	Clay gravel	Clay gravel**	....
Costs:							
Grading	$3,688.62	$1,176.63	$3,786.37	$2,934.82	$773.76	$3,607.95	$15,968.15
Subgrading	789.44	257.33	....	653.33	64.18	808.89	2,573.17
Loading and hauling gravel	4,885.55	2,246.25	1,021.64	5,057.57	338.67	7,587.93	21,137.61
Spreading and rolling gravel	394.72	128.66	Inc. in haul	326.67	17.83	404.44	1,272.32
Clearing	105.00	250.00	$205.00	95.00	45.00	200.35	900.35
Fencing	36.00	15.00	352.00	92.00	....	48.80	543.80
Concrete culverts	1,177.39	......	464.06	....	....	1,009.09	2,650.54
Drain pipe	117.10	88.50	183.95	116.50	....	86.20	592.25
Miscellaneous const. work	350.99	186.81	45.24	132.57	....	19.50	735.11
Total amount of contract	11,544.81	4,349.18	6,058.26	9,408.46	1,239.44	13,773.15	46,373.30
Material purchased by commission	170.72	127.53	224.12	312.67	....	898.50	1,733.54
Misc. expenses by commission	66.53	25.16	63.23	54.98	5.59	67.63	283.12
Engineering	382.92	146.31	206.23	317.68 10.00***	40.46	479.03	1,582.63
Total cost of construction	12,164.98	4,648.18	6,551.84	10,103.79	1,285.49	15,218.31	49,972.59
Average haul (miles)	1.23	1.91	1.60	1.56	1.00	2.00	...

*Hauled from pits owned by the county. **Tishomingo gravel from Sta. 0 + 00 to Sta. 12 + 00. ***Extra paid engineer for work not covered by his contract.

VIEW ON THE ROBINSON-GILMER ROAD, LOWNDES COUNTY, MISSISSIPPI, SHOWING GRAVEL SURFACED ROADWAY AND METHOD OF TREATING SHOULDERS.

struction $48,106.82. The items of the commission's expenses, $283.12, and the engineering, $1,582.63, bring the grand total to $49,972.47, as shown in the table.

In regard to the cost of engineering, it should be noted that the preliminary survey of the roads had been made previously at a cost of about $10 per mile, this cost not appearing in the item of engineering in the table. The item of $10, "extra," for the cost of engineering on the Pickensville Road was for the survey of ½ mile of road that was not improved. This is accounted for by an agreement that the engineer should be paid $20 per mile for all roads or sections of roads which the commission should order surveyed but which should not be built.

OLD MILITARY ROAD, LOWNDES COUNTY, MISS.—GRAVELED SURFACE.

The Tishomingo gravel used from Sta. 0 to Sta. 12 + 0 on the Robinson-Gilmer Road is a special gravel that was imported for use on the approach to a bridge where traffic is unusually heavy. It is superior to the local gravel and costs 90 cts. per ton, delivered. This gravel, which is used very extensively for road building in Mississippi, is found in large masses in the hills east of Iuka, Tishomingo County, Miss. It consists of very hard and dense water-worn stone, occurring in "kidney" shaped pieces ranging from 1 in. to 6 ins. in the greatest dimension, imbedded in a yellow clay of the consistency of fire-clay. It is gotten out of the banks by dynamite and loaded into cars by steam shovels. Fifteen cars of this gravel were used on the Robinson-Gilmer Road.

CONTRACT PRICES—ROAD WORK BY SUPERVISORS' DISTRICT NO. 2, LOWNDES COUNTY, MISS.

Item.	Amount.
Grading (one way)*	19½ cts. per cu. yd.
Subgrading	2 cts. per sq. yd.
Loading	12½ cts. per cu. yd.
Hauling	35 cts. per cu. yd. per mile
Spreading and rolling	6 cts. per cu. yd.
Clearing	$5.00 per station
Fencing	4 cts. per lin. ft.
Concrete Culverts:	
Plain	$10.00 per cu. yd.
Reinforced	12.51 per cu. yd.
Drain Pipe (hauling and laying only):	
(Pipe furnished by Commission)	
Vitrified:	
15-in	40 cts. per lin. ft.
18-in	40 cts. per lin. ft.
24-in	50 cts. per lin. ft.
Cast Iron:	
18-in	30 cts. per lin. ft.
24-in	40 cts. per lin. ft.
Galvanized Iron:	
12-in	12 cts. per lin. ft.
15-in	15 cts. per lin. ft.
18-in	20 cts. per lin. ft.
24-in	25 cts. per lin. ft.
Engineering	3¼ per cent.

*Measured once only—in this case in embankment.

Highway Work in Caddo Parish, Louisiana, During the Past Year.

The total expenditure for road building in Caddo Parish, Louisiana, from October 1, 1911, to February 1, 1915, was $592,397.22, according to a recent statement by Parish Engineer J. T. Bullen.

The work done included the construction of 81.70 miles of road. Of this total mileage, 3.07 miles comprised grading work, of which .75 mile was very heavy grading. The work done by the Engineering Department has also included $46,000 worth of concrete bridge work and the expenditure of about $12,000 in maintenance.

There is about $35,000 available for work this year, and it is expected that about 5 miles of road will be built.

The Distinction of Being the Smallest Town in Kansas Having Paving is claimed by Sabetha, a town in Nemaha County. It has a population of 1,973, and it has recently paved 22 blocks with brick. It is stated that present plans call for the paving of from 25 to 40 additional blocks in the spring.

The Construction of 23 Miles of Graveled Streets to connect the paved streets of Mobile, Ala., with county roads radiating from that city comprised a large part of the street work done by the city last year. In addition, the laying of 20,603 sq. yds. of asphalt pavement was completed during 1914, the work including several streets in the northern portion of the city.

Repair and Maintenance Work in Monroe County, New York, During 1914 cost $176,154.61, according to a report submitted to Division Engineer Filkin by H. G. Hotchkiss, Jr., Acting Superintendent of Maintenance. This work, which was performed on 220 miles of highway, included the application of asphalt and tar surface treatments on 99 miles of road at a cost of $34,061.86. The cost of engineering and inspection amounted to 5.04 per cent. of the total cost, according to the report, which is said to be one of the lowest percentages reached in the county.

Concrete Paving on Walnut Street, Macon, Georgia

By CARL H. FULLER*

Walnut Street, betwen First and Spring Streets, was a quagmire. No other word in the English language would fitly describe it without qualifying adjectives; and the camera, because of its inability to penetrate below the surface, could not do the situation justice. Even in dry weather these two blocks were almost impassable for an empty wagon, while around some of the worst spots the City Street Department had erected fences and barricades to prevent the unwary teamster from miring his team. The residents along the street desired to have it paved and the City Council was quite willing to do its part but the city engineering forces were doubtful of ever laying a satisfactory paving on such a poor foundation, while none of the local contractors desired the job.

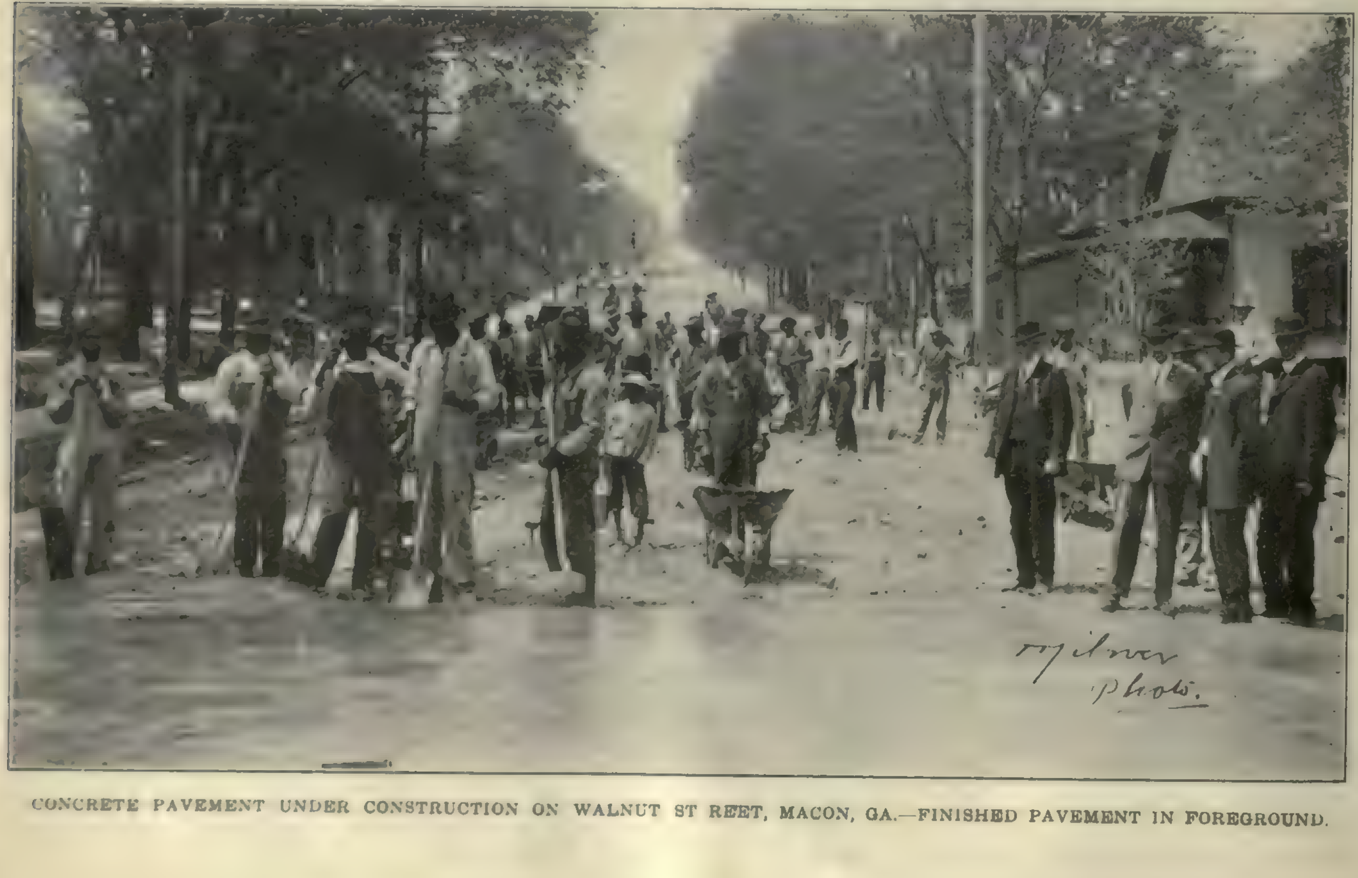
Finally the Southern Engineering and Contracting Co., of Macon, submitted a proposition to pave this area, some six thousand square yards, with 8 ins. of concrete using no reinforcing, of the proportion of 1 cement, 2 sand and 3 of crushed rock, for $1.40 per sq. yd. Even they would not guarantee their work. They were awarded the contract in March of 1913 and proceeded with it immediately under the most discouraging of conditions, that of bad weather, completing it within six weeks although actual construction occupied only some twenty working days during that period.

This job was in a way, an experiment, being the first street in the city of Macon to be paved with concrete. Many predictions of failure were made, principally because of the unstable foundation, but the pavement has been in service now for nearly two years, without any checks or other signs of settlement showing on its smooth surface. It does not give up any dust under traffic or show signs of uneven wear.

The granite curbing was not included in this contract, having been set by the city forces some time prior to paving. Grading was light, being only such as was necessary to put the roadway into shape for paving. An attempt was made to roll the subgrade with a steam roller but that proved impracticable except in spots, so hand tamping was resorted to, but only to give an even surface.

As soon as sufficient roadway had been fine graded, sand and crushed rock in about the right proportions were distributed along both sides of the street and two Standard one-half yard batch mixers, operated by gasolene engines were set up, working side by side about a hundred feet back from the paving. The street being 44 ft. wide, there was plenty of room to work two crews without interference, the method of operation being quite clearly shown in one of the accompanying illustrations. Sand and stone were handled from the stock piles to the mixers and measured in the ordinary steel wheelbarrows, while the mixed concrete was handled from the mixers to the placing in two-wheeled carts, as shown, each cart holding ¼ cu. yd. of wet concrete and being handled by two men.

The crown of the roadway is 6 ins. above the gutter line and level with the top of the curbing. Grades were established every few feet by the engineer on the center line and on the quarters. No mold boards were used, the iron grade pins with a heavy cord stretched between them proving a fairly efficient guide. These pins and lines may be seen in the illustration. The concrete was dumped and raked to approximate grade with garden rakes and finished by patting to grade with long handled, flat bladed shovels, no float of any kind being used. This gave a fine roughened surface that has since worn smooth, revealing the hard, even grain of the concrete.



CONCRETE PAVEMENT UNDER CONSTRUCTION ON WALNUT STREET, MACON, GA.—FINISHED PAVEMENT IN FOREGROUND.

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*Consulting Engineer, Macon, Ga.

Longitudinal expansion joints were provided along the curbing and tranverse joints every 20 ft., using two thicknesses of two-ply roofing felt, the transverse joints being held to line by boards until the next section of concrete had been backed up enough behind them to hold the felt in line, when the boards were withdrawn.

After the surface had set sufficiently, a thin layer of sand was scattered evenly over the top and kept moist for 7 days and the road opened 14 days after placing the concrete.

Portland cement in bags cost $1.61 net, f. o. b. Macon, and 4 cts. per barrel to deliver on the job, as required from day to day. The sand used was local pit sand and was delivered on the job in slat bottom wagons holding approximately 24 cu. ft., at 75 cts. per load. It had to be screened through a coarse screen to remove vegetable matter. The stone was crushed granite, 2 ins. and under in size, costing $1.52 per ton f. o. b. Macon, and 30 cts. per ton for hauling from the cars to the job, about ¼ mile.

The concreting gang usually consisted of 38 negro laborers, paid at the rate of 12½ cts. per hour, working under the direction of two white foremen, one on the mixers and one on the paving. This force was divided as follows and handled about 85 cu. yds. of concrete per hour, when things were running smoothly: 2 men fine grading; 8 men loading rock to the mixers, 4 men screening and loading sand to the mixers, 4 men handling cement and charging mixers, 2 men operating mixers, 2 men dumping mixers, 12 men handling 6 carts from mixers to paving; 2 men finishing, and 2 white foremen.

This labor reduces to a unit cost of 60 cts. per cu. yd, or 13.3 cts. per surface yard for mixing and placing. The total cost per surface yard of concrete in place, including the fine grading, subdivides as follows:

Cement	$0.581	per	surface	yard
Sand	0.084	"	"	"
Crushed rock	0.278	"	"	"
Hauling cement	0.014	"	"	"
Concrete labor	0.133	"	"	"
Hauling crushed rock	0.057	"	"	"
Fine grading	0.120	"	"	"
Incidentals	0.033	"	"	"
Total	$1.300	"	"	"

Street Work in Walla Walla, Washington, in 1914

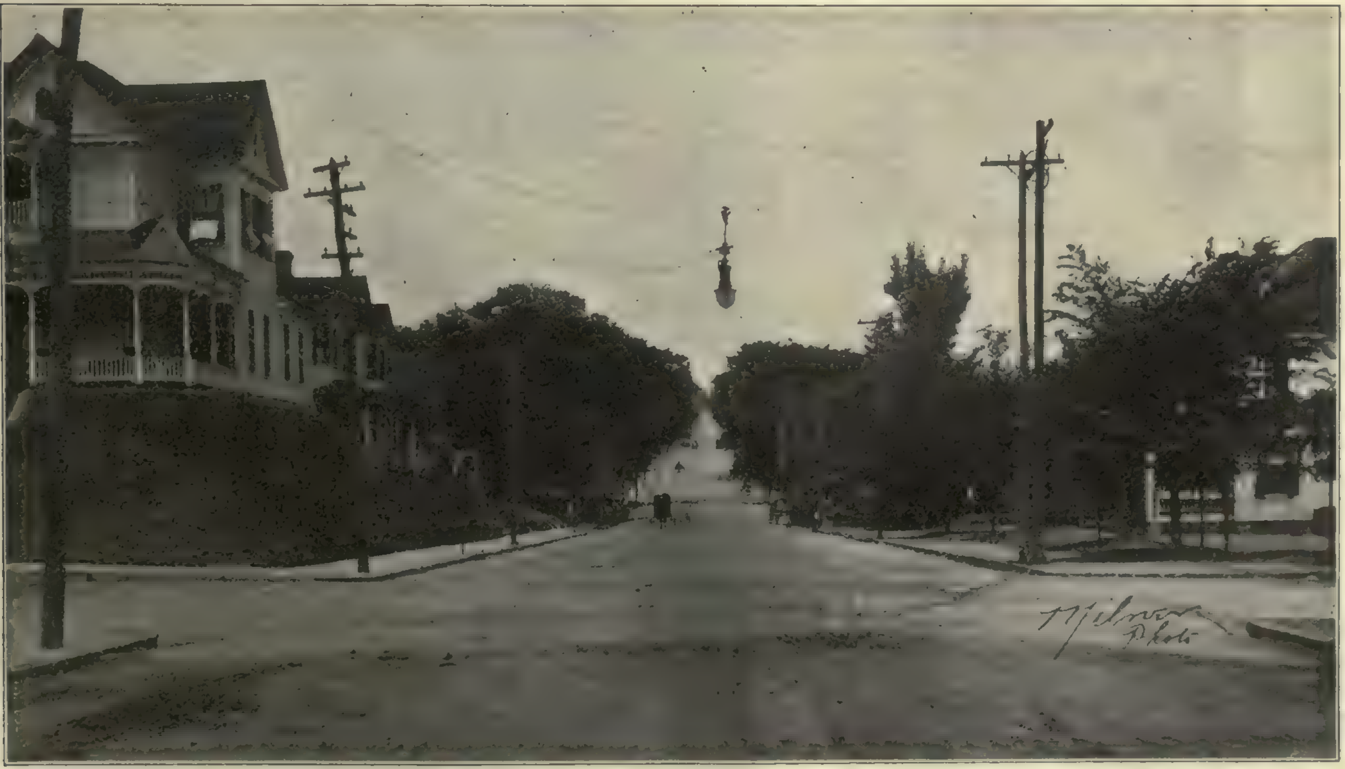
According to a recent statement by City Engineer W. R. Rehorn, of Walla Walla, Wash., the total cost of all work in local improvement districts during the year was $41,160.50. This included the following work:

Concrete sidewalk, 66,604 sq. ft. at 11½ cts.	$7,652.44
6-in. concrete pavement, 975 sq. yds. at $1.35	1,316.40
Concrete curb, plain, 7,741 lin. ft. at 33 cts.	2,552.25
Concrete curb, armored, 673 lin. ft. at 55 cts.	370.25
4-in. gravel bitulithic pavement, 11,440 sq. yds. at $1.48.	16,931.95

According to the statement of City Engineer Rehorn, 33 local improvement districts were formed, 29 of which were completed, 2 were not completed and 2 were discontinued. In addition, 8 districts were started but were discontinued before they were made local improvement districts. Plans, specifications and preliminary estimates were gotten out for all of the 33 districts and the 8 proposed districts and, in addition, final estimates and final assessments were made in the 29 completed districts. During the year 259 sidewalk permits were taken out and surveys were made for a total of 46,200 lin. ft. or 267,300 sq. ft. of concrete sidewalk, exclusive of the walk constructed under local improvement districts. These walks were put in by the property owners at a cost of $30,739.50.

The Total Expenditure for Street Improvements in San Diego, Cal., during 1914, was $622,701.07, according to a recent statement. The work done included grading, paving and the construction of sewers, sidewalks and curbing. The expenditure for similar work in 1913 was $980,290.72.

Convict Labor on the Highways of Warren County, New York, Has Been Used Successfully during the past year, according to the annual report of County Superintendent of Highways B. E. Murray. It is reported that convicts were used in the towns of Hague and Warrensburg on work in addition to the regular road work performed by local labor. Superintendent Murray states that this work would not have been done had convict labor not been available, so that the complaint made at first that free labor was deprived of work by the convicts was without foundation. He recommends in his report that all of the towns in the county put in applications for prisoners to be used in the spring.



COMPLETED CONCRETE PAVEMENT ON WALNUT STREET, MACON, GA.—PAVEMENT FINISHED WITHOUT MOLDBOARDS OR FLOATS.

Papers Presented at the Eleventh Annual Convention of the American Road Builders' Association

(Continued from the Issue of February 6)

In the issues of January 2 and February 6 we printed all but three of the technical papers presented at the Fifth American Good Roads Congress and Eleventh Annual Convention of the American Road Builders' Association, held at Chicago, Ill., in December of last year. The remaining papers are presented in the following pages.

In accordance with the plan followed in the issue of February 6, each paper is accompanied by a brief summary of the discussion which followed it. As previously noted, the full text of the papers and discussions will be printed in the official proceedings of the A. R. B. A.

RECENT PRACTICE IN CONSTRUCTION IN WOOD AND GRANITE BLOCK

By **WILLIAM A. HOWELL**,
Engineer of Streets and Highways, Newark, N. J.

Wood Block

That the neglect to pave properly the main street of a city affects to a degree an entire nation in the course of a year came to be realized by the City of Newark in November, 1912. The occasion was the annual football game between Yale and Princeton, at Princeton. The occupants of probably 3,000 automobiles from all parts of New England, from Canada, from New York State, from as far west as Chicago, passed over Broad street, Newark, and commented bitterly on the condition of the street. They could not realize how a city of the size of Newark could tolerate such a pavement.

In 1884, Broad street was paved with a new granite pavement on a sand foundation. This pavement gave general satisfaction until about ten years ago. The increased use of the automobile, and the desire of department store owners and various large business concerns for a smooth pavement started the agitation for a new pavement, which was not realized until 1914. One reason for delay was that in Newark the bulk of the cost of all paving improvements has to come out of the pockets of the property owners on the street to be improved. This is true not only of the first paving, but also of the second, third or even fourth. The city has grown so rapidly, that it has not been able to secure adequate legislation at Trenton, to properly apportion the cost of improvements of main arteries on the city at large, as is done in many large cities. Another cause for delay in the repaving of Broad street was the bitter contest between the Mayor and the Board of Public Works over the selection of the proper paving material to be used on the street, the Mayor waging persistent warfare in behalf of granite block, and the members of the Board of Public Works equally as determined in their advocacy of wood.

Broad street is to Newark, what Broadway is to Manhattan; it is Newark's most important street. Two railroad stations, a dozen banks, two of the largest insurance companies in the country, the City Hall, the Public Library and the postoffice are all located on this street. Agitation had become so strong for a new pavement that as far back as 1910 provision had been made for the installation of electric light and telephone conduits, new high pressure water mains, new gas mains, and new water, gas and sewer lateral house connections. Excavations necessary for the installation of these various pipes and conduits left the pavement in a very rough condition, as, anticipating that a new pavement would soon be laid, the temporary repaving following the various excavations was poorly done. The result was that Broad street was probably the poorest paved main street in the United States in November, 1912, when the thousands of automobiles passed through the city on their way to Princeton. Even after the award of the wood block contract but before any actual work had been done under that contract, a visiting delegation from Atlantic City, who were inspecting city streets, rode over the street and came to the conclusion that Newark was twenty years behind the times with such a pavement on its principal street. The public press while advising caution in the selection of the right kind of pavement, urged the authorities to action.

The members of the City Plan Commission in 1913 deemed it their duty to recommend a suitable pavement to the Mayor who appointed them. After careful investigation and taking numerous traffic records, Messrs. George B. Ford and E. P. Goodrich, Consulting Engineers to the Commission, presented their summary, and recommendations, to the City Plan Commission as follows:

"Asphalt pavement should be eliminated from consideration, because, despite its lower cost, the expense of maintenance makes its ultimate cost as much, or larger, than either granite or wood block. Furthermore, the constant repair demanded by asphalt means that the streets are always being torn up, with the consequent incommoding of the traffic. Wood block and granite are so nearly alike in first cost and in maintenance cost, that this item may be eliminated from consideration. Granite block is a little less slippery, and a little longer wearing, and a little easier to repair, and a little easier to superintend and inspect. Its tractive value is slightly less than wood block. It is more dusty and much more noisy. The comparative advantages of the two are nearly equal, but we recommend wood block for Broad street, because of the recent experience in Manhattan and other cities of the country, which has shown a rapidly growing tendency to make quietness the first consideration in determining the type of pavement. We realize that the rapidly growing use of rubber tires tends to swing the balance in favor of granite block and that twenty or twenty-five years from now, when the question of repaving of Broad street will probably come up again, the almost universal use of rubber tires or something similar will cause the abandonment of wood block in favor of stone block or some similar development, but we believe that present conditions demand the use of wood block."

The newly organized Board of Public Works of 1913 composed of five commissioners took up vigorously the matter of paving the street from Belleville Avenue to Poinier Street, a distance of approximately 12,200 ft., calling for an area of 88,500 sq. yds. independent of the portion to be paved by the street railway company where new granite blocks were to be used. The proposed improvement was divided into four sections for convenience, and contracts were tentatively awarded July 31, 1913, for 4-in. wood block on an 8-in. concrete foundation, the blocks to be treated with 20 lbs. of oil per cu. ft.

The Mayor vetoed this award August 14, 1913. His veto was sustained by the Board of Public Works on September 4, 1913, it requiring four votes to pass a measure over the Mayor's veto and only three votes being forthcoming, one commissioner, although personally favoring wood block, deferring to the wishes of the property owners on the lower end of the street, many of whom were opposed to any kind of new pavement. Proceedings were promptly started all over again, the lower section of the street was eliminated from consideration, and new bids were received on October 30, 1913, for 75,500 sq. yds. of 4-in. wood block with

18 lbs. of treatment, the concrete foundation to be 8 ins. in thickness. This contract was finally awarded about February 1, 1914. The average price per square yard of the low bidder on the four sections had been $3.67 and the figure of the low bidder at the second letting was $3.34 per sq. yd. The total amount of the successful bidder's contract was close to $300,000. As under existing laws, 70 per cent. of the cost of local improvements is assessed directly on the property owners benefitted, but 30 per cent. of the total cost being assumed by the city at large, in the case of Broad Street the property owners fronting on the new pavement will have to pay $14, $15 and $16 per front foot according to the width of the roadway in front of their property.

The pavement, completed October 1, 1914, is practically 10,000 ft. long or about 1.9 miles. For nearly one mile of this distance the street is 132 ft. wide between building lines, the width of the roadway is 92 ft. between curbs and the space between the street railway and the curb is about 38½ ft. on each side of the street. The grades on Broad street are remarkably flat. On 20 per cent. of the total area paved, the prevailing grades are less than 3 ins. per 100 ft.; on 50 per cent. the grades range between 3 and 6 ins. per 100 ft.; on 20 per cent. additional the curb grades are between 6 and 12 ins. per 100 ft.; and on but 10 per cent. of the pavement are the curb grades in excess of one per cent., the steepest grade on the newly paved portion being slightly over 2 per cent. for a few hundred feet only. The specifications were prepared by Mr. Morris R. Sherrerd, Chief Engineer of the Board of Public Works, after a most painstaking and exhaustive study of the subject and after holding consultations with most of the leading wood block experts in the eastern portion of the United States. The Board of Public Works accompanied by the Chief Engineer inspected wood block pavements in a number of cities. The following extracts from the specifications may prove of interest:

> The blocks shall be treated with the preservative, so that the charge for each batch of blocks shall contain an average of 18 lbs. per cu. ft. The specific gravity shall not be less than 1.07 nor more than 1.12 at a temperature of 38° C. The blocks comprising each charge shall be selected, as nearly as may be, so that all of the blocks placed in the cylinders will be of the same degree of seasoning.
>
> The new blocks shall be laid on a mortar bed composed as follows: A layer of sand and cement 1 in. in thickness, mixed dry in the proportion of one part Portland cement to four parts of sand shall be spread on the concrete foundation, and struck to a surface parallel to the grade and contour of the finished pavement. The cushion of sand and cement, unless previously moistened, shall be lightly sprinkled with water, and the blocks shall be immediately set thereon.
>
> The blocks shall be from 5 to 10 ins. long, but shall average 8 ins.; they shall be from 3 to 4 ins. in width, and they shall be 4 ins. in depth. The blocks, however, shall be of uniform width for each city block, and there shall always be a difference between the width and depth of the blocks of not less than ¼ in.

(Note: This last provision was inserted to facilitate the laying of the blocks with the head up.)

> The blocks shall be thoroughly wet by immersion in suitable tubs, or tanks of water, just before being laid, care being taken to prevent the water from becoming a nuisance, or doing any damage to the work.

This method of thoroughly soaking the blocks for ten minutes before laying them in the pavement is new to this country and has been criticized on account of the expense involved in maintaining so large a number of tubs and the men necessary to handle them properly. The results so far obtained seem to justify the method and it will undoubtedly be a feature of any future wood block contracts entered into by the City of Newark.

Of the total area laid, about 40,000 sq. yds. were shipped in schooners from Mobile, Ala., from the works of the Republic Creosoting Co. These blocks were nearly 4 ins. wide and 4 ins. deep, running about 38 to the yard. The remaining 35,000 sq. yds. were manufactured and treated in Newark at the local works of the American Creosoting Co. These blocks were 3 ins. wide and 4 ins. deep, and ran about 55 to the square yard. Mr. R. Ernest Beaty, Assoc. M. Am. Soc. C. E., inspected the manufacture and treatment of the blocks at both plants. An interesting statement from Mr. Beaty is appended. This work was prosecuted with great vigor, and finished in advance of the allotted time. There were lawsuits instituted threatening to stop the work but fortunately they were of no avail.

A very interesting feature connected with the paving of the street was the installation of a large number of traffic platforms at important street railway transfer points. These platforms were built of concrete. They averaged in length about 85 ft. They were all 6 ft. wide, located 2 ft. outside of the rail, and averaged 6 ins. in height above the pavement. The steps of the local street railway cars are rather high, and these platforms at once became popular with many thousands of people. As the roadway on the greater part of the street is 38½ ft. between the rail and curb, the installation of these platforms did not interfere with the free movement of traffic except in possibly two instances.

Mr. Sherrerd's specifications provided for expansion as follows:

1. By providing for expansion joints along the curbs, 1½ ins. wide, to be filled with a suitable bituminous filler capable of passing a good penetration test.
2. By laying the blocks comparatively loosely in the pavement, in order not to have any tight joints, sand being carefully broomed into the joints.
3. By soaking all of the blocks in 40 or 50 half barrels used as tubs, in which the blocks were required to be submerged in water for ten minutes before laying.

The only trouble occurring on the street of any moment was along the street railway tracks, in spots where the rail moved. Even if the movement was slight, it would gradually raise a few blocks and the sand would run down under the block, causing the block to be higher than the rail. This happened in less than a dozen spots in 10,000 ft. of pavement. The street railway people made the necessary repairs to their tracks in these spots, and the contractor relaid the block, using cement in the joints for a space of about one foot from the rail. Some of this action of the movement of the rails was due to the uneven wear of the head of the rail, producing a hammer effect. These inequalities in the rails have been ground out, and this action helped in preventing a movement of the rail.

The Engineering Department also made, in its judgment, ample provision for drainage by building a large number of additional side sewer basins, and rebuilding nearly all of the old basins on the entire length of the new pavement, so that at the present time there is a good, serviceable basin every 200 ft. on either side of the street. As low crowns are especially desirable on wood block pavements, the street railway tracks were lowered as much as possible, and the old gutter depths of 7, 8 and 9 ins. on the old granite pavement were reduced to 5½ and 5 ins. on the wood block pavement.

The bleeding was extremely noticebale on several warm days when the thermometer ranged from 90° to 97° in the shade and possible 115° to 120° on the pavement, but by causing the blocks to be covered with a thin coating of sand, no unpleasant conditions followed. During the summer and fall the pavement was sprinkled quite frequently. Early in the fall a thick coating or crust formed on top of the blocks, caused by the oozing out of the preservative and its coming in contact with sand. The contractor scraped this off and removed it from the street on several occasions. This coating did not stick to shoe leather to any appreciable extent, and did not produce any unfavorable comment from storekeepers in regard to being tracked into buildings and soiling the floors, as was the case with the wood block pavement on

Market Street, Philadelphia, a few years ago. In an editorial a short time ago, on slippery conditions existing on a number of heavy traffic streets in the center of the city, one of the leading local papers remarked that horses seemed to have less trouble getting a foothold on the Broad Street wood block pavement than they had on the various asphalt and bitulithic streets in the same locality. Whether that statement would hold good throughout the winter is problematical.

The Yale-Princeton football game occurred on November 14, this year, and thousands of automobiles passed through the city as was the case two years ago, but their occupants found a different main highway pavement from the one they encountered in 1912; and the change met universal approval.

Referring to the inspection of the blocks at the two plants, Mr. R. Ernest Beaty makes the following comments in a note to the writer:

"The above contract, as is generally known, calls for approximately 75,500 sq. yds. of pavement. Of this yardage about one-half is of 4x4x8-in. blocks, while the remainder is of 3x4x8-in. blocks. The 4x4-in. blocks were manufactured by one company, while the 3x4-in were manufactured by another. Each order was supplied from a very good quality of southern long leaf yellow pine, and the various charges making up the two orders were very carefully inspected and manufactured. Tests made for 'drying out and absorption' did not demonstrate any marked superiority of one order of blocks over the other. This is hardly to have been expected, as apart from variation (within limits) of specifications of oil used, tests previously made show that the smaller blocks (3x4-in.) are practically as waterproof under the customary test for absorption, i. e., 24 hours in an oven at 100° F. followed by immersion in water for 24 hours, as are the longer or 4x4-in. blocks. The principal point of interest to be noted in connection with this contract lies in the difference in chemical constituents of the two preservatives used in treating the two orders. Attached is chart showing analysis of twelve samples of oil. Of these samples six were taken from oil used on the Mobile blocks and six samples were taken from oil used on the other blocks. The oil specifications for this work were as follows":

> The preservative to be used shall be a product of coal tar, which shall be free from oil adulterations, and contain no raw or unfiltered tars, petroleum compounds, or tar products, obtained from any process other than stated.
>
> The specific gravity shall not be less than one and seven hundredths (1.07) nor more than one and twelve hundredths (1.12) at a temperature of thirty-eight (38) degrees Centigrade.
>
> Not more than three and one-half (3½) per cent. shall be insoluble by continuous hot extraction with benzole and chloroform.
>
> On distillation which shall be made exactly as described in Bulletin No. 65 of the American Railway Engineering and Maintenance of Way Association, the distillate based on water free oil, shall not exceed one-half (½) of one per cent. at one hundred and fifty (150) degrees Centigrade, and shall not be less than thirty (30) nor more than fifty-five (55) per cent. at three hundred and fifteen (315) degrees Centigrade.
>
> The oil shall not contain more than three per cent. of water.

It is to be noted from this chart that, while within limits of specifications, there is quite a dissimilarity in the two groups of samples. The specific gravity of the oils; the specific gravity of the fraction between 235° C. and 315° C., and the insoluble matter in oils of the two groups, vary somewhat; but the marked difference lies in the fraction between 210° and 235° C. It is, of course, unwise to attempt to classify or designate these fractions of coal tar distillate, as being certain *definite* compounds; however, we may say that the fraction between 210° and 235° C. is ordinarily considered commercially as being "napthalene" with a certain portion of allied constituents. In one case, it is seen, that one of the oils (considered as a group) contains fully four times as much of the napthalene compounds as the other. Also, that this oil contains correspondingly a lesser amount of higher boiling fractions, such as anthracene, etc., than the group with which it is compared. It has been demonstrated time and again by evaporation tests from flat dishes that some of the lower boiling distillates of creosote oil are exceedingly volatile when compared with the higher boiling fractions. For this and other reasons, many chemists are opposed to allowing more than a minimum amount of this fraction to be present in oil used for treating paving blocks.

On the other hand this fraction is considered very valuable in an oil for treating piling work, and one of our large public service corporations requires 20 or 25 per cent. of it in an oil used in treating exposed timbers, and for conduit purposes. One advantage it possesses is the comparative ease with which it penetrates the blocks. However, equally satisfactory results were secured with both oils. This point alone cannot be relied upon for oil containing the greater amount of the fraction under discussion, or against the oil containing the lesser amount. Many theories do not work out in practice, and the opponents or advocates of either side of the controversy will find in service conditions on Broad Street a practical argument bearing on the matter. Inasmuch as both orders received the same careful inspection when manufactured, were laid under identical inspection in the street and by the same contractor, engineers of the department interested in wood block pavement should note with interest comparative results regarding "bleeding" and "buckling" of pavement in the respective areas paved with the 4x4-in. and the 3x4-in. blocks.

OIL USED IN TREATING 40,000 SQ. YDS. OF 4"X4"X8" WOOD PAVING BLOCKS FOR BROAD ST., NEWARK, N. J., DURING THE YEAR 1914.

Sample	To 200° C.	200°-210° C.	210°-235° C.	Total to 235° C.	235°-315° C.	Total to 315° C.	Sp. Gr. of Oil	Sp. Gr. of Fraction*.	Water.	Matter. Insoluble
	%	%	%	%	%	%	%	%	%	%
1......	0.0	0.0	2.08	2.08	33.70	35.8	1.113	1.05	0.0	0.8
2......	0.0	0.0	2.10	2.1	33.70	35.8	1.113	1.05	0.0	0.8
3......	0.2	0.35	5.95	6.50	38.60	45.1	1.085	1.05	0.0	1.1
4......	0.0	0.65	3.70	4.35	33.45	37.8	1.115	1.05	0.0	2.3
5......	0.0	0.50	4.27	4.77	35.65	40.3	1.108	1.05	0.0	1.0
6......	0.0	1.00	5.40	6.40	30.75	37.2	1.095	1.06	0.0	2.3
Av'ge,.	0.03	0.4	3.9	4.4	34.30	36.7	1.103	1.05	0.0	1.38

OIL USED IN TREATING 37,000 SQ. YDS. OF 3"X4"X8" WOOD PAVING BLOCKS FOR BROAD ST., NEWARK, N. J., DURING THE YEAR 1914.

Sample	To 200° C.	200°-210° C.	210°-235° C.	Total to 235° C.	235°-315° C.	Total to 315° C.	Sp. Gr. of Oil	Sp. Gr. of Fraction*.	Water.	Matter. Insoluble
	%	%	%	%	%	%	%	%	%	%
7.....	1.80	3.2	15.2	20.2	22.7	42.9	1.117	1.04	1.0	2.0
8.....	0.50	1.4	20.5	22.4	26.2	48.6	1.100	1.04	0.5	1.4
9.....	0.50	2.8	18.3	21.6	24.1	45.7	1.109	1.04	3.0	1.7
10.....	0.50	1.5	19.5	21.5	22.8	44.3	1.10	1.04	0.0	1.6
11.....	0.50	2.0	14.0	16.5	24.0	40.5	1.11	1.04	0.5	1.7
12.....	0.70	2.8	18.9	22.4	27.2	49.6	1.09	1.04	1.7	1.9
Av'ge..	0.70	2.3	17.7	20.7	24.5	45.2	1.101	1.04	1.1	1.7

*Sp. Gr. fraction between 235° and 315° C. at 38° C.

Granite Block

That a smooth, durable, close jointed, grouted granite highway, passing through the center of large towns or acting as a connecting link between two neighboring towns, is desirable for all kinds of traffic, and especially so for heavy traffic, is conceded by all well informed road builders. This form of pavement, introduced originally in Worcester, Mass., and made popular about five years ago through the efforts of Chief Engineer Morris R. Sherrerd of the Board of Public Works of Newark, N. J., has established itself in a large number of important cities east of the Mississippi River.

Mr. Sherrerd was the pioneer in the establishment of the present close-jointed granite block, having recommended a paving block that could be laid with a ⅜-in. joint as far back as 1908. This width of joint is included in the specifications for granite block pavements in one of the boroughs of Greater New York, but the majority of cities using this form of pavement have accepted the specifications of the Society for Standardizing Paving Specifications (merged in 1913 with the American Society of Municipal Improvements) in which the width of joint is ½ in. Under Mr. Sherrerd, the ⅜-in. joint was given a thorough trial, with both fine grained and coarse grained granite blocks, and it was found to be practically impossible to carry into effect with coarse grained granites.

There was a popular fallacy years ago that granite was granite; in other words, that granite pavements did not have to be as carefully inspected during their construction as brick or asphalt pavements as the granite material was supposed to be absolutely uniform and homogeneous throughout the entire shipment. Municipal engineers frequently come across soft places in granite pavements, where the pavement is wearing much more rapidly than at other points, although the traffic is the same throughout the entire length of the pavement. This condition may arise on account of veins of soft or foreign material in the granite quarry or it may have been caused through the deliberate shipment of defective material, known to be defective when originally shipped.

Basing his opinion on situations similar to the above enumerated, the writer has come to the conclusion within recent years, that it is almost as necessary to have frequent tests of granite blocks, as it is to have car-load tests of paving brick shipments. The necessity for the adoption of some simple and comparatively inexpensive test to speedily determine the quality of granite block shipments becomes more and more apparent to thoughtful men interested in paving. The old method of crushing granite cubes has practically been abandoned. Personally the writer hopes to soon see a method introduced similar to the standard abrasion test for vitrified paving bricks. In order to carry out that idea properly, all blocks tested would have to be cut to a uniform size and be made from the same material.

At present the most reliable test for toughness is made on the Page impact machine, and fairly satisfactory results are being obtained through this method. On the recommendation of the Sub-Committee on Standard Specifications on Stone Block Paving of the American Society of Municipal Improvements, the minimum figure for toughness was placed at 11 in the 1913 convention of that society. In 1914 at the Boston Convention the impact figure was changed to 9. The necessity for a rigid adherence to this test has been demonstrated on several occasions, lately coming within the notice of the writer.

A very heavy traffic street, in a large city, carrying two street railway tracks, on a very narrow roadway was paved with granite known to be especially desirable and suitable for its grouting qualities. The distance from the outer rail to the curb was only 10½ ft. Granite blocks from the same quarries had previously been used on other heavy traffic streets but where the traffic was not concentrated over such a narrow space. The pavement almost immediately after receiving traffic began to show decided signs of wear, much of the wear appearing on a line parallel with the track and about over the outside edges of the ties of the street railway tracks. The grouting did not last more than a few days within a space of about two feet outside of the rail. The explanation given by the granite people was that the frequent passing of heavily loaded trolley cars and motor trucks caused frequent vibration of ties and a consequent jarring of the granite paving, causing the newly grouted granite blocks to rock and never permitting the cement grout to have a chance to set and consequently the grouting in this 2-ft. space was worthless. The constant rocking of the blocks produced abrasion to such an extent that within a week or ten days a small hole appeared in the pavement. Within two months these holes became exceedingly numerous. The situation was still further aggravated by the passage of heavy motor trucks overlapping the new pavement, it not being possible to block off the newly paved roadway for its entire length in order to afford clearance for the overhang of the trolley cars. Tests were made of some of the blocks taken from the pavement and also of new blocks taken from the same quarries. The highest figure given in any of the impact tests was 8 and in several instances the figure fell to 4. On the other hand with granite blocks submitted as samples from a well known Southern quarry noted as producing a very hard granite, the impact figure was 13. This granite was not very susceptible to cement grout.

The inference from these results is plain. On heavy traffic granite streets where the traffic cannot be shut off sufficiently long through the grouting and cement setting period, and on granite streets where the impact tests show a figure as high as 13, cement grout should not be used at all, but tar and gravel filler should be substituted.

Newark has laid since 1900, 18 miles of close-jointed grouted granite pavements, including many miles in factory districts, in hilly sections and on main arteries connecting Newark with such important suburban towns as Elizabeth, East Orange, Bloomfield, Irvington and East Newark.

Napped, reclipped, grouted granite pavements have also been introduced in Newark by Mr. Sherrerd. This form of pavement was first laid in Bronx Borough in 1909. The idea originated in the fertile brain of Mr. William Booth who was not only the owner of granite quarries but also a paving contractor. This form of granite pavement has become exceedingly popular in the vicinity of New York City and such cities as Troy, Albany, Schenectady, Philadelphia, Newark, and the Boroughs of Brooklyn, Manhattan and the Bronx. All have mileages of napped reclipped granite pavements. In Newark, Broad Street was paved with wood block, the pavement being completed about October 1, 1914. The yardage was about 75,000 sq. yds. The old granite blocks, about 75 per cent. of which were in fairly good condition, were carted away and sold to contractors at $30 per thousand. The contractors halved them, reclipped and redressed them and used them for paving a number of other streets. In one section of the city there were three hill streets paved with new granite blocks and three other streets paved with the napped blocks, and in some instances the napped block pavement produced a smoother surface than the new block pavements. The specifications for this form of block are very similar in many towns, although in some cities instead of halving the blocks, they are cut into three and four fragments, depending on the length of the block.

In Bronx Borough the average cost for 267,150 sq. yds. was $1.68 per sq. yd. including a 5-in. concrete foundation, up to November, 1913, for recut, old granite block compared with an average of about $3.67 per sq. yd. for new granite block on the same foundation. The blocks were split, broken in two and dressed so as to lay ½-in. joints. The finished blocks are from 6½ to 8 ins. long, 3½ to 4½ ins. wide and 5½ to 6½ ins. deep. Blocks less than 11 ins. long are reheaded, when necessary, and dressed, and as a rule used along railway tracks. The splitting and dressing is done on the streets by stone cutters who receive about 1½ cts. per redressed block, or $15 per thousand; each man getting out from 450 to 500 blocks per 8-hour day. He earns from $6.75 to $7.75 per day, depending partly on his skill and speed and partly on the character of the granite and condition of the old blocks. The blocks when dressed are piled along the sidewalk until the concrete foundation is ready for the pavement.

Newark awarded contracts for nearly 40,000 yds. of this form of pavement, in all but one contract the blocks to be furnished the contractor at the City Yard, the contractor to have the blocks napped and reclipped before hauling to the improvement. The competition was so keen and the successful bidder was so low in his figure that he could not afford to pay reasonable rates to the stone cutters, and frequent strikes and labor troubles resulted. The city is seriously considering the project of employing expert stone cutters to nap and reclip many thousands of blocks, under city supervision, and then sell the completed blocks to the contractor. In this way better results could be obtained. As to the financial saving effected by the use of recut and napped or redressed blocks in Newark, with prevailing prices, the assessment on the property owners on a 36-ft. street, using new granite and new curb would be about $8 per ft. or $200 for a 25-ft. lot. If napped and reclipped old blocks were used (the old blocks being sold to the contractor by the city) probable cost per foot of assessment to the property owner would be $6.35 per front ft. or $158.75 per 25-ft. lot, with old blocks obtained from other streets.

But if the old paving blocks on the street are taken up, napped and redressed and used in repaving that pavement, a still greater saving can be effected; so that the estimated cost per foot front would be $4.75, or $120 per 25-ft. lot. A granite pavement which has given twenty-five or thirty years' service, may give an additional service of twenty-five years under the methods described in the latter portion of this paper.

Summary of Discussion

George W. Tillson, Consulting Engineer to the President of the Borough of Brooklyn, New York, N. Y., was the first speaker in the discussion of Mr. Howell's paper.

Mr. Tillson took up first the character of the block, saying that while the wood used in this country is almost entirely southern yellow pine, it would be extremely desirable to get another kind of wood that would give equally satisfactory results. The most important part of wood block pavement work, according to Mr. Tillson, is probably the treatment of blocks, regarding which there is considerable uncertainty at the present time relative to both the treatment itself and the character of the preservative. At present the general feeling among engineers, according to Mr. Tillson, is that creosote oil is the best all around preservative. In the early days the only creosote oil used was obtained from coal tar, but since the manufacture of water gas a certain amount of creosote oil has been produced therefrom. The question at present, he said, is whether water gas tar oil or coal gas tar oil should be used, or both; and there is need for experiments to determine this question. Another open question regarding preservative oil, according to Mr. Tillson, is the specific gravity of the oil. Some engineers favor the lighter oil on the ground that it will penetrate the block more uniformly and produce just as good results in the preservation of the wood. Others favor the heavier oil because they are satisfied that it is less volatile and that it will penetrate the blocks sufficiently to preserve them and prevent bulging. The preserving of the block, according to Mr. Tillson, is particularly important in this country because, as a rule, the traffic is not sufficient to wear out the pavement. In the old country, he said, where the traffic is heavy, such thorough treatment of the blocks is not necessary because on many of the streets the blocks wear out before they rot out.

Mr. Tillson then took up the question of slipperiness, saying that it is one of the defects of wood pavement and one which we should work to overcome. This slipperiness can be obviated in places by sprinkling with sand, and a block has also been devised with lugs, the idea being that if the blocks expand the expansion will be taken up by pressing the blocks together rather than by the bulging of the paving. Mr. Tillson then took up the question of the amount of preservative to be used, citing the practice in Brooklyn and Manhattan and referring to the absorption test employed. Another test formerly used to determine the amount of preservative was that the block should sink in water, which would happen only if the block had had a treatment of very nearly 20 lbs.

Mr. Tillson then took up the matter of stone block pavements and traced the evolution of the present block from the large, rough stone blocks which were first used. He also reviewed the efforts to secure smoother blocks that could be laid with smaller joints, and discussed at some length the various methods of filling the joints. He stated that in the East granite pavements have been very much improved during the past three or four years, and that it is hoped that in the next ten years they would be improved as much more. In closing, Mr. Tillson referred to the possibility of reducing noise by securing a filler that would take up the noise to some extent and to the possibility of using a mixture of sand and pitch as a joint filler.

The paper was next discussed by E. R. Dutton, Assistant City Engineer of Minneapolis, Minn. Mr. Dutton stated that the ordinary creosote wood blocks can safely be used on grades up to 3 or 4 per cent. if they are made of southern pine, and on grades up to 5 or 6 per cent. if made from softer wood, such as Norway pine. He said that in Minneapolis Norway pine blocks had been used on the heavier grades without difficulty, but that it had been found that the wear on such a block was about twice that on a southern yellow pine block. He also referred to the use of the wood block provided with lugs and to the use of sand on the surface as a temporary relief from slipperiness. Another method cited by Mr. Dutton for overcoming slipperiness was the laying of every other row of blocks about one-half inch below the adjacent blocks. His comment on this was that it "overcame the slipperiness by introducing the element of roughness with a vengeance and made a high priced corduroy road out of a material that should have produced a pleasing and smooth surface." Another method, according to Mr. Dutton, is that in which the upper corners of the blocks are chamfered to a depth of about one-half inch. These blocks are laid in contact, the same as ordinary blocks, with the chamfered corner on the downward side. This method, he said, has proven very satisfactory and does not materially detract from the smoothness of the pavement nor add very much to the cost. He also mentioned the practice of separating the rows of blocks by wooden strips.

H. W. Durham, Chief Engineer of Highways of the Borough of Manhattan, New York, N. Y., followed Mr. Dutton. In discussing the necessity for special qualities in the stone and the tests to which the stone should be subjected, he said that, in his belief, it is much more important to have the blocks accurately dressed and laid on a minimum thickness of cushion with the closest possible joints than to say that the rock from one quarry is better than another or that if the product from certain quarries does not pass certain qualifications these products can not be used. He said that it had been urged that the borough authorities require certain minimum specifications for the blocks very much in line with those employed by the United States Office of Public Roads. On making tests on stone from all the quarries furnishing materials, he found that if these requirements were insisted upon it would be necessary to rule out about 90 per cent. of the available quarries. In regard to the matter of joint filler, he said that there were successful instances of both bituminous and grout filler. Under the conditions prevailing in New York, according to Mr. Durham, the first consideration is that of noise, and this has very largely determined the selection of bituminous filler. He said that a coal tar filler, mixed with the greatest amount of sand that it would take up and yet be of a suitable consistency for pouring, had been used very successfully in New York, although up to the present time it had not been possible to use over one-third sand by volume.

In regard to wood block paving, he said that the tendency in New York is to approximate more nearly the London practice of laying the blocks on a hard instead of an elastic cushion with the use of a bituminous filler instead of a sand or cement grout filler. The practice abroad, he said, is almost invariably to lay the blocks on a smooth concrete foundation. At present this is not attempted here, but a mortar cushion composed of cement and sand is being laid on a concrete foundation and the blocks laid on that. In conclusion, Mr. Durham took up the matter of cleaning, saying that, to his mind, this was the final question in regard to the satisfactoriness of a wooden pavement. He said that unless the street cleaning department performed its duty thoroughly on a wooden pavement, he thought that pavement would be less satisfactory than any other type.

CONVICT LABOR IN ROAD CONSTRUCTION

By T. J. EHRHART

State Highway Commissioner of Colorado

The question of convict labor is a very important one, involving as it does in our state, the welfare, care and treatment of some eight hundred men, and also the consideration that must be given to the matter of avoiding, as far as possible, competition with the free labor outside the prison walls. The involuntary slaves of the commonwealth who are confined for specified terms in the State Penitentiary, are entirely in the hands of and at the mercy of the government of the state.

The question may arise as to whether confining these men is a punishment and only that, or whether they are confined for the purpose of simply protecting the public from further crimes on their part, with the hope that a period of imprisonment will work a change in their moral nature, such that at the end of their term they will have ceased to be a menace to the community. If the first idea is the only one, that is, that the committing of a crime must be punished, and that punishment is by confining a man at hard labor for a certain term of years without considering in any way the possibility of changing his nature so that he may cease to be a criminal upon his release, then the proposition would resolve itself into the state simply guarding these men and getting all they could out of them, without any regard to the effect upon the men themselves, turning them loose at the end of their term in practically the same or worse condition than they were when they entered the prison.

It seems to me that the other view must be taken; that is, that every effort must be made during the term of imprisonment, to correct the criminal impulses, and nourish and encourage the growth of moral restraint, so that the prisoner can be usefully employed, and leave the prison a law-abiding person.

It is necessary that whatever work the prisoners are placed at should be of a useful nature, and be of some benefit to them upon their release.

Many different forms of employment for the prisoners have been tried in the various states of the union, from the contract system, where the labor of the men is contracted to certain parties at definite sums for certain definite periods; the shop system, where the prisoners are employed inside the prison walls at such work as can be secured by the state, such as garment making, shoe manufacturing, and making of other utensils and clothing. In addition to these forms of labor, there is certain necessary work about the prison, requiring the use of quite a number of men in the bakery, laundry, necessary repairs in the buildings, the care of the livestock, and the care of the prison grounds. These are incidental employments which take care of a small number of the total number confined.

It seems to me that the method of contracting to individuals the labor of the prisoners has always resulted in dissatisfaction, mistreatment of the men, and that as far as the prisoner himself is concerned, it is one of the worst forms of labor that could be devised.

The making of garments and implements by the prisoners for sale on the markets has also been objectionable, both of these forms being competition with free labor.

In Colorado we have the prisoners doing the necessary work about the penitentiary, including the construction of additional buildings, cell houses, hospitals, etc., and also a good sized farm, upon which many of the prisoners are employed during the season.

In addition to this, beginning in 1899, the State started to use the convicts upon the construction of roads of the state.

The first work, in 1899, was done in the upper Arkansas River aVlley, in the neighborhood of Buena Vista, under a bill introduced in the Legislature by the writer. In this year considerable work was also done in Fremont County by the convicts. Later, in 1905, a bill was introduced by Senator Lewis, and another one in 1907 by Senator Barella, the latter bill providing for a convict built road from the New Mexico state line at the south, to the Wyoming state line on the north. The Lewis bill is the one under which our convicts are now being successfully worked on the roads under the present administration. Copy of this bill follows:

S. B. No. 224, by Senator Lewis.

AN ACT

Providing for the working of convicts in Colorado State Penitentiary upon the Public Roads and Highways within any county and upon the streets and alleys within the cities and incorporated towns located in the State of Colorado.

BE IT ENACTED BY THE GENERAL ASSEMBLY OF THE STATE OF COLORADO.

Section 1: Upon the written request of a majority of the board of county commissioners of any county in the State of Colorado, the Warden of the Colorado State Penitentiary, situated at Canon City, in Fremont County, shall detail such convicts as in his judgment he shall deem proper, not exceeding the number specified in said written request, to work upon such public roads and highways of such county, or streets and alleys of any city or incorporated town within such county as shall be designated in said written request of said county commissioners. Provided, that such county shall pay all additional expenses of guarding said convicts while working upon said public roads and highways within such county, and shall furnish all tools and materials necessary in the performance of said work; And, Provided, That when said work is done within the limits of any city or incorporated town within such county, or city or incorporated town where said work shall be done shall likewise pay all additional expenses of guarding such convicts while performing said work and shall furnish all necessary material used in said work.

Section 2: Said convicts when employed under the provisions of Section 1 of this Act shall not be used for the purpose of building any bridge or structure of like character which requires the employment of skilled labor.

Section 3: The Board of Penitentiary Commissioners are hereby empowered to adopt a special rule applicable solely to convicts employed on the public work herein authorized and contemplated, whereby convicts so employed shall be granted additional good time allowance, conditioned upon their good behavior and cheerful compliance with all rules that may be made by said board or said superintendent for the management and control of convicts so employed.

Section 4: All acts, or parts of acts, in conflict herewith are hereby repealed.

Section 5: In the opinion of the General Assembly, an emergency exists; therefore, this act shall take effect and be in force from and after its passage.

Approved April 11, 1905.

Work was started on the main state road from Trinidad to the New Mexico line, and finished in 1907 by Warden Cleghorn. The famous "Sky Line Drive" at Canon City was also completed under Mr. Cleghorn's administration, and the development of the system of working convicts without gun guards and solely upon honor was started by Mr. Cleghorn. Our present Warden, T. J. Tynan, took charge of the work in 1909, and has extended and developed the system, until at this time it is one of the very successful adjuncts of the state system of road work.

We find that a certain proportion of the men confined can be advantageously used without guards on the state roads, working the same as any other road camp would work, under the direction of a superintendent and foreman. At the present time there are about 300 convicts employed on the roads in the state of Colorado. This would be about 30 per cent. of the entire number of prisoners in the penitentiary. The Warden has full control in the selection of these men, taking their word of honor that they will not attempt to escape or go away, and the fact that less than 1 per cent. of the prisoners employed on the roads during the last six years have attempted to escape, amply testifies to the manner in which the prisoners keep their word. There are no armed guards of any kind employed at any of the road camps in this state. The number of prisoners to a camp runs from 25 to 50; there is one superintendent in charge of the construction and of the men, at each camp. He is assisted by one to three foremen, as may be required, according to the character of the work and the number of men in the gang. The men are absolutely free, except during working hours, but they are required to keep within the vicinity of the camp. The night watchman is, as a rule, one of the prisoners. The men are sheltered in tents, which are provided with stoves, plenty of warm bed clothing, and they are also furnished good substantial clothing from the penitentiary; they are also furnished tobacco, plenty of good food, with the extras of the season; have their ball games and other sports on holidays, and on Sundays have religious services; when close to streams where fish abound, they have their fishing, and in fact are really enjoying nearly the same freedom, except the ability to leave the camp, that any other man would enjoy at a free labor camp. The open air work is beneficial to their health, they have learned to handle tools, and to do a fair day's work, and the fact that they have been trusted and earned the regard of the officials in charge, most certainly has had a beneficial effect upon them.

The state pays no wages or per diem to these men, but allows them, under the law and the regulations of the penitentiary officials, an allowance for their work, which taken together with allowance for good behavior, practically cuts their minimum sentence in half.

As far as the effect upon the prisoner is concerned, their employment upon the roads is absolutely a success, and even were there no profit to their employment to the state, outside of that, I believe it should be continued for that reason alone, but the states does get returns from the men by the work accomplished. The records of cost, kept by the camps in our state, show that the total cost per man per day in the camps for food for the prisoner, all extras, such as tobacco, and other incidentals and including the cost of food for the stock employed in bringing supplies and other work, will run from about 60 to 90 cts. per day per man, and the average cost per man per day actually worked on the road varies from about 80 cts. to $1.50 per day. The cost of the work accomplished will, of course, vary with the character of the work and will run from $500 per mile to $5,000. It seems to me from our experience in this state that the economy of the use of prisoners is reached when the road camps contain not less than about 25 to 30 men as a minimum; that 40 to 50 men would be a better sized camp for the reason that the overhead charges are nearly the same in either case, and if the camp is too small, then the overhead charges run too high.

The location of the camp and the cost of transportation of the prisoners going and coming is an item which needs consideration, as if a number of short term men are placed at any great distance from the penitentiary, the cost of bringing them to the work and returning them for a few months' employment would bring the charges up considerably.

Another point that might be mentioned is the employment of satisfactory and sufficient tools and machinery for doing the work. We have found that the employment of drilling machines for rock work is a very economical expenditure, and for the grading, that the use of a road grader and other forms of road machinery are also profitable investments.

Our state has all nationalities represented in the prison, and on our road work; men who have been convicted of all characters of crime against the established rules of society.

In conclusion, in the gradual development of this system of employment of prisoners, which has gone through its various phases in the past fourteen years, we have developed what seems to be a satisfactory method of employment for the trustworthy prisoners, an employment which is far superior to any of the old contract or factory system methods.

Summary of Discussion

A. D. Williams, Chief Road Engineer of West Virginia, was the first speaker in the discussion of Commissioner Ehrhart's paper. Early in his remarks, Mr. Williams stated that while Mr. Ehrhart had dealt with the subject more or less from the standpoint of the ideal he wished to deal with it from the practical side.

The question of convict labor is a broad one, according to Mr. Williams, and is one of the greatest problems with which we are confronted. After referring briefly to the evils of the contract system, Mr. Williams said that there are two objects of the confinement of prisoners—first, the protection of society, and, second, the reformation of the prisoner. Confinement in idleness means physical deterioration accompanied by mental deterioration, and the result is that the man leaves prison worse than when he entered it. This being so, we are confronted with the question of how to employ prisoners. This employment, as pointed out by Mr. Williams, must be something that will be the most beneficial to the prisoner; that will make him as nearly self-sustaining as possible during the period of his punishment, and that will best enable him to pay to society the debt that he owes. Mr. Williams pointed out why the contract system will not do this and said that in order to get the best results the prisoner must be employed out of doors. The employment must also be something whereby the prisoner can pay back to society by his labor the debt that he owes, and there is no way of better fulfilling these two conditions than using the prisoner on road work.

Mr. Williams said that we cannot expect to use all of the prisoners successfully and profitably on the public roads, and said that he agreed with a statement made by Commissioner Coleman of Virginia that prisoners should be divided into four classes. He then outlined this classification, by which the prisoners are divided into four groups. The first of these should be worked within walls under strict guard; the second should be employed in stockades; the third, consisting of honor men, should be used on the public roads without guards; and the fourth, consisting of men who can be paroled, could be used for maintenance work.

Mr. Williams then took up the work done in West Virginia, describing the methods of employing prisoners and giving detailed cost data on the work done during 1914. He then discussed at some length the relative efficiency of prison and free labor, and then described the utilization of county prisoners in West Virginia. This, according to Mr. Williams, has been successful and has proven of great benefit to the prisoners.

In conclusion, Mr. Williams expressed the belief that the greatest advantage of prison labor is its benefit to the prisoners and, therefore, to society at large.

Charles M. Kerr, Assistant Engineer, Louisiana State Highway Department followed Mr. Williams. The scientific handling of prisoners, according to Mr. Kerr, will mark a great stride in the progress of civilization. He pointed out the necessity for a penal system that will result in the payment of the convict's debt to the state and will also permit the convict at the expiration of his term to resume his place in society. After referring briefly to the evils of the contract system, he expressed the belief that there is no system whereby more good can be accomplished than by the employment of all able-bodied male prisoners on road work.

Mr. Kerr then stated that in Louisiana the efficiency of convict labor in the construction of highways has been demonstrated, and described in detail the work done there, tracing first the history of the employment of convict labor and then taking up the details of the system as applied there, including the cost and other phases of the work. During this part of his discussion he called particular attention to the necessity for competent supervision; described arrangements for housing, clothing, feeding and maintaining the convict force, and spoke at some length on the subject of equipment. He also touched upon the organization of the work and gave cost data.

C. B. Scott, Assistant State Highway Commissioner of Virginia, spoke on convict labor in Virginia, describing in detail the methods employed, and giving cost data.

W. M. Bryant, Chairman of the Board of County Commissioners of Kalamazoo County, Michigan, described briefly the use of prisoners in Kalamazoo County, where in the winter prisoners are used for the operation of a plant where tile is made and in summer are used on the roads. The prisoners are employed on the honor system and convicts are used in the same gangs with free labor. The results, according to Mr. Bryant, are satisfactory.

Mr. Williams said that in West Virginia the working of convicts and free labor in the same gang has not proven satisfactory. He also described at some length the prisoners employed in the state, touching upon the characteristics of the various nationalities represented. In reply to a question by Mr. Scott as to whether or not he considered convict labor successful, Mr. Williams replied that he did.

Mr. Scott asked Mr. Williams if he did not think it an advantage to have prison labor because of the fact that a certain force can be counted upon every day. Mr. Williams agreed to this.

Dr. Joseph Hyde Pratt, State Geologist of North Carolina, who was scheduled to discuss Mr. Ehrhart's paper, was not present but sent in a written discussion, which was read by title. Dr. Pratt dealt with the general phases of the convict labor problem, touching upon work in North Carolina and Colorado. A large portion of his discussion was devoted to the classification of convicts, the manner of working the different classes, the methods of compensating the men in the different classes, their maintenance and their guarding. In conclusion, he pointed out that it is not economical to work convicts in small camps as the overhead charges are too great, recommending a minimum of 30 men and stating that at least 50 to a camp would be better. He also called attention to the importance of proper equipment and competent supervision.

DUST PREVENTION AND STREET CLEANING*

By WILLIAM H. CONNELL,

Chief, Bureau of Highways and Street Cleaning, Philadelphia, Pa.

I am in the same position that the rest of you are—prepared to listen to a paper on this subject and to discuss the paper. As a matter of fact, I didn't write anything, but was going to discuss the paper itself, as presented. I was informed by Mr. Powers at the close of the morning session that Mr. Davis couldn't get here and hadn't written a paper, and asked if I would open this subject. I will just outline a few elementary points and hope to open the subject for discussion.

The title of the paper is "Dust Prevention and Street Cleaning," which, of course, is a very broad subject, but it is an important one. While street cleaning has been included with dust preventives for the first time, it is logical that they should be discussed together, as one of the main problems of street cleaning is dust prevention. We have had papers on dust prevention, but we have never combined dust prevention and street cleaning, and they are so closely related that it is a step forward to make the title of the paper "Dust Prevention and Street Cleaning."

I will first take up the dust layers, and that leads us into the bituminous surface treatments. In defining dust layers, I refer to the lighter oils and other materials which are supposed simply to lay the dust. Water, of course, is included in these materials. The bituminous surface treatments are dust preventives, because, properly applied to the type of road suited to that character of treatment, they make a more or less dustless road. The practice I have followed in connection with dust layers is to apply about .2 gal. of 19 to 23 Be. gravity asphaltic oil per sq. yd., the object being just to have this material lay the dust as long as it lasts and then disappear from the road. If it goes into the road, this character of material tends to disintegrate the road. This method of treatment costs in Philadelphia $0.0113 per sq. yd. for each treatment, which does not include any covering.

The number of treatments depends on the traffic conditions. Roads carrying a normal amount of traffic, such as you have in the suburban sections of the city, and the more or less heavily traveled country roads, will require one treatment early in the spring, say in May, or as early as you can get it on, depending on the climatic conditions, and another treatment later on in the season, about August. The second treatment will disappear from the road in the latter part of November, and you will have a normal road surface to go through the winter. This does away with the mushy condition which we all experienced in the early days when we put on heavy applications of oil to lay the dust, and they remained on the roads throughout the winter. I am not going to name all the materials that can be used, because they have been more or less standardized. Of course, we have oils from a number of different manufacturers, and all of them—or practically all—have their place in this method of treatment. We have also calcium chloride and other products which are intended to lay the dust.

The bituminous surface treatment, which I term as a dust preventive, should be applied on water bound macadam roads that are in good repair. In this class of work we have different methods of treatment; we have the lighter materials, such as refined coal tar (Tarvia B) and refined water gas tar (Ugite B), which materials can be applied cold. The first treatment requires about ½ gal. per sq. yd., covered with 15 lbs. of chips or fine washed gravel. In connection with this I might say that I was rather looking forward to what Mr. Davis was going to say, as I understand he has been using slag screenings for his covering. I have no reason to believe that slag screenings will not answer the purpose just as well as trap rock chips, and in a community where they are available, of course, they would be cheaper. This treatment carries through the season, except on some heavily traveled roads, where, in a few cases, it is necessary to apply an extra treatment during the first season. The second treatment averages about ⅓ gal. per sq. yd., with about the same amount of chips or gravel as in the first treatment. The idea of putting on a small amount of covering is simply to protect the treatment so that it will not be taken up on the tires of vehicles before it is thoroughly set up and will not incorporate into the bituminous material and form a pad. I might say in the first place that the practice is to let the treatment remain about twelve hours before covering it and opening the street to traffic. The bituminous material is only to act as a seal coat like paint on steel or woodwork; and when it requires touching up, simply repaint it. This does away with the patching that is required where the pad method is used. Such patching is very difficult—in fact, so difficult that a number of localities have given up this method of treatment.

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*Remarks by Mr. Connell in place of Charles O. Davis, Superintendent of Street Cleaning, Milwaukee, Wis., who was scheduled to present a formal paper, but was unable to be present.

Another type of bituminous treatment should be selected where there is heavier travel, and for this purpose you would use a slightly heavier bituminous material, one that is applied hot, such as the heavier refined coal tar (Tarvia A) or refined water gas tar (Ugite No. 2), or an asphalt cut-back which is applied cold. The method of treating the road and spreading the chips, etc., is the same as with the lighter material. The asphalt cut-back is more or less new and probably needs some explanation. It was evolved from the tar treatment. The purpose was to get an asphalt that could be applied to the road and which had sufficient stability and was low enough in penetration at least to set up and at the same time could be applied cold by a pressure distributor. I have been carrying on some experiments in that direction for the past four years. At present in Philadelphia we use about 65 per cent. of 100 to 125 penetration asphalt, and about 35 per cent. of a 50 to 54 commercial naphtha. They are thoroughly mixed and then applied to the road surface cold. The naphtha simply acts as a carrying agent and leaves a very light crust of asphaltic material on the road. The first treatment of this material requires about .4 gal. per sq. yd.; the second treatment should not be more than .2 gal. per sq. yd. I find that you don't require as much of the asphaltic cut-back as you do of tar for the second treatment, and there is danger, great danger, in applying too much. The tar sets up and becomes perfectly hard, more or less brittle, and there is very little tendency for it to push; the asphaltic material, however, is more or less resilient and elastic, through all seasons of the year, and is more apt to push under traffic, and for this reason it is desirable to apply just a film coat that will not push under traffic.

Bituminous surface treatments and dust layers are more or less standard for all classes of roads. First comes the dust layer for the earth roads, macadam roads, and all gravel roads that are not in condition for the better grade of bituminous treatments; second, the film coat (hot or cold application) for the roads that are in condition for the better class of bituminous treatments, which, if properly maintained, will last almost indefinitely. This statement isn't based on any mere conjecture or theory, but on fact. It has lasted in a number of localities in this country for seven or eight years and, I am informed, is a method of treatment that is largely used abroad. The asphaltic cut-back material has had four years' test. When the stone is very soft, the pad method will have to be used. These treatments, of course, are all dependent upon the amount and character of traffic. These bituminous surface treatments are not suitable where the traffic consists primarily of heavy loads carried on steel tires. A most important point is to put on the second application at the proper time. If, in the spring, the road requires a treatment and you neglect it for about a month, it will result in the road rutting and will require extensive patching or resurfacing. The patching that is ordinarily required with this method of treatment is very slight, it being necessary only to paint the surface and throw on some chips. You should not put on an excess of material; this is apt to make the patch higher than the adjoining surface of the road. It is a simple method of patching. I believe in Chicago and vicinity you have soft limestone, which, if too soft, would not be suitable for a film coat treatment, in which case it would probably be desirable to adopt the pad method of treatment; however, in the Eastern States there is plenty of stone hard enough for the lighter superficial or film coat method of treatment.

The accompanying table was presented in a paper which I read before the Franklin Institute, Philadelphia, and gives the cost of bituminous surface treatment work in Philadelphia. In the last column, headed "average total cost, first and second treatments, 1913 and 1914," is shown a saving in the different treatment of 1 ct. to 1.5 cts. per sq. yd. in 1914 over 1913. This is a result of the men becoming more familiar with the work and the better organization of the forces. This work was entirely new, both to the laborers and the supervising force in 1913. The labor cost for this work was as follows:

Laborers	$2.00 per 8 hour day
Foremen	4.00 per 8 hour day
Teams	5.00 per 8 hour day

This about covers, in a very general way, the more or less standard dust layers and bituminous surface treatments. The street cleaning work is in a cruder state than any other branch of highway work. It is work that should rightfully come under an association of this kind, because in all the towns and counties on the main thoroughfares it is becoming more and more necessary every day to do some sort of street cleaning work. It is a greater problem, of course, in the cities. There has been considerable discussion as to the proper kind of cleaning, and I am going to outline briefly the methods used in Philadelphia and Washington. The work is done under a schedule, each street is cleaned as often as it requires cleaning, or as, in the judgment of the officials, it requires cleaning and the finances will permit. In this connection I would also say that it is very easy to go too far with the cleaning of city streets. It is not necessary and the cities cannot afford to have the streets as clean as a dining room table. One of the great problems is to clean the streets sufficiently to keep the dust down, and to help eliminate the spread of disease from this cause. If you do enough cleaning to accomplish these two purposes, I believe you are doing as much as any city should do; you should not spend all your money on cleaning or on any one function of public works.

In Philadelphia each street is cleaned every day, every other day, every third day, or once a week. This is the method of cleaning for city pavements, including asphalt, granite block and wood block, etc. The macadam roads are cleaned once a week, once every two weeks, and some of them in the country districts only once a month. The cleaning of the macadam roads consists wholly of brushing into the gutters the material that has accumulated on the road, shaping up the shoulders, cleaning the gutters and carting away the dirt. Such a schedule of cleaning will keep the macadam roads in pretty good shape.

In the cleaning of city pavements three types of machines are used, machine brooms, squeegees and flushers. The machine broom cleaning is, or should be, used largely on pavements that are not sufficiently smooth to clean with the squeegee; this would include certain classes of the granite block and asphalt pavements that are more or less wavy, the brick pavements not in good condition, and all classes of pavements that are not smooth enough to scrub with the squeegee.

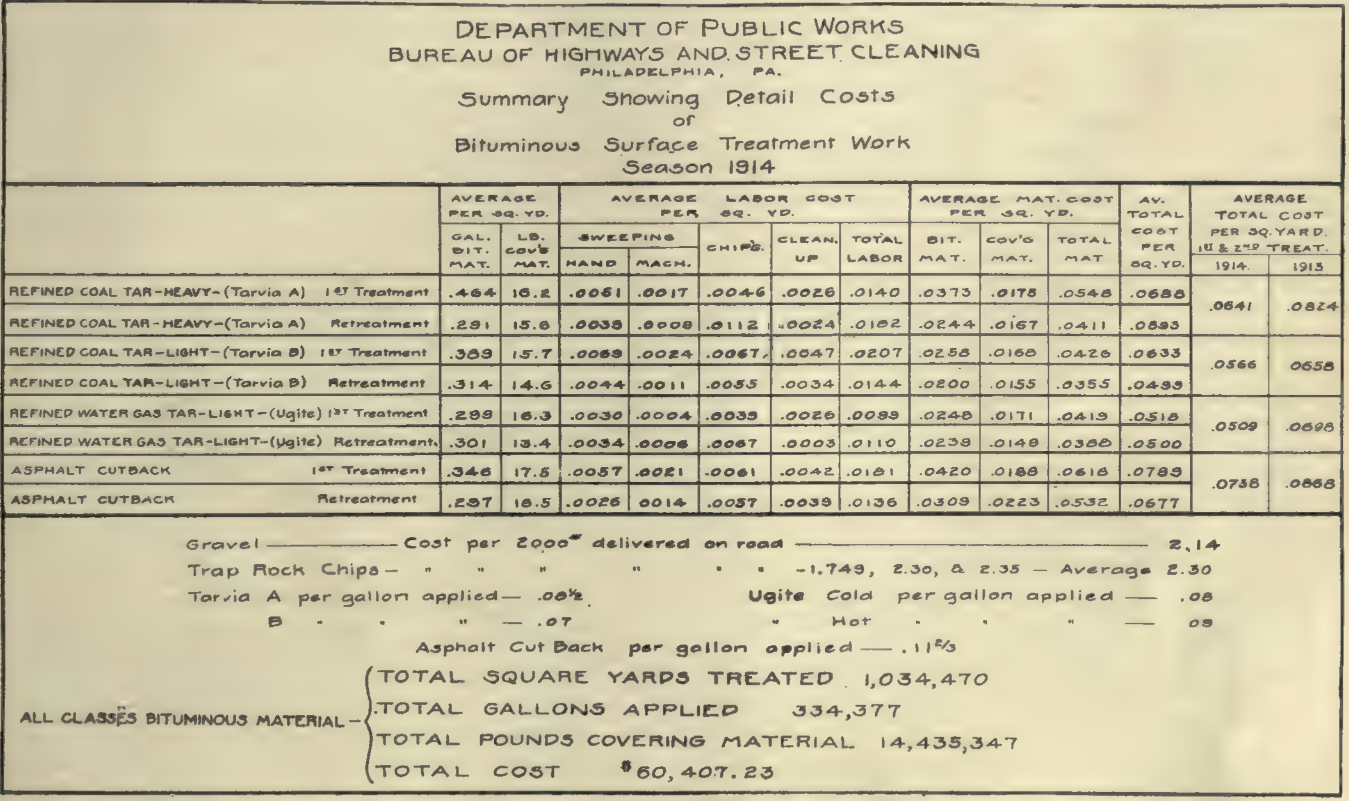
The flusher cleaning is intended more for granite block streets than for any other type. The water is applied at the rate of about 35 to 40 lbs. pressure, in such a way that it forces the dirt out of the joints in the pavement, and drives it over toward the curb where it is gathered up and hauled away.

The squeegees are used on smooth pavements. In all these methods of cleaning, a gang follows the machine with hand brooms and wagons and picks up the dirt that is pushed to the gutter.

All three of these types of cleaning have to be supplemented by pick-up cleaning, which is done by blockmen who are assigned to specific areas. The size of these areas depends on the amount of cleaning necessary, varying from as low as 2,000 or 3,000 yards in the center of the business section, to as high as 25,000 yards in the outlying districts. The work of the blockmen consists of taking up any dirt accumulating on the street during the time intervening between the regular schedule for machine cleaning. In some cities, the cleaning is done by gangs, who form in lines across the street and with their hand brooms push the material from the center to the side, one pushing it over to another, until it is brushed to the curb.

There was some discussion at a recent engineering meeting—the meeting of the American Society of Municipal Improvements—with reference to using water in street cleaning, and to illustrate this point I just ran across a paper read before the American Society of Municipal Improvements by Mr. Slater of Providence, stating that it was unnecessary to use any water on their asphalt and bituminous pavements. The discussion was by Mr. Warren, and a statement was made that in Washington, for example, and New York, they do not use water. This is very misleading, because it is incorrect. They believe very much in the use of water in Washington and in New York, and also in Philadelphia. We do not believe, though, in leaving water on the street long enough to damage the pavement, and that is the main point. Squeegee cleaning consists of a sprinkler preceding the squeegees; the idea is to sprinkle sufficiently in advance of the squeegees, which also have a sprinkler attachment in front of their rubber brooms. The first sprinkling is to moisten the dirt on the pavement sufficiently in advance to loosen it up, and the second sprinkling puts enough water there for the rubber squeegee to scrub the pavement. It is very evident when this method is used, and when these rubber squeegees thoroughly scrub the pavement, that all the dust is removed, and it doesn't leave sufficient water on the pavement to do any damage.

The ideal method would be vacuum cleaning on all classes of pavements, but we haven't today any method of vacuum cleaning that has been considered sufficiently satisfactory, in a general way, to be adopted by the different cities. They are all trying to improve on the machinery with a view to getting some vacuum cleaner that will do away with some of the types of machines and methods of cleaning we are now using. I think that the question of using water on pavements should be emphasized, because it is very clear that if the water is simply put on the pavement, and the pavement scrubbed, the water will not remain long enough to do any damage.



DEPARTMENT OF PUBLIC WORKS
BUREAU OF HIGHWAYS AND STREET CLEANING
PHILADELPHIA, PA.
Summary Showing Detail Costs
of
Bituminous Surface Treatment Work
Season 1914

	AVERAGE PER SQ. YD.		AVERAGE LABOR COST PER SQ. YD.					AVERAGE MAT. COST PER SQ. YD.			AV. TOTAL COST PER SQ. YD.	AVERAGE TOTAL COST PER SQ. YARD. 1ST & 2ND TREAT.	
	GAL. BIT. MAT.	LB. COV'G MAT.	SWEEPING		CHIPS.	CLEAN. UP	TOTAL LABOR	BIT. MAT.	COV'G MAT.	TOTAL MAT			
			HAND	MACH.								1914.	1913
REFINED COAL TAR-HEAVY-(Tarvia A) 1ST Treatment	.464	16.2	.0051	.0017	.0046	.0026	.0140	.0373	.0175	.0548	.0688	.0641	.0824
REFINED COAL TAR-HEAVY-(Tarvia A) Retreatment	.281	15.6	.0035	.0008	.0112	.0024	.0182	.0244	.0167	.0411	.0593		
REFINED COAL TAR-LIGHT-(Tarvia B) 1ST Treatment	.389	15.7	.0069	.0024	.0067	.0047	.0207	.0258	.0168	.0426	.0633	.0566	0658
REFINED COAL TAR-LIGHT-(Tarvia B) Retreatment	.314	14.6	.0044	.0011	.0055	.0034	.0144	.0200	.0155	.0355	.0499		
REFINED WATER GAS TAR-LIGHT-(Ugite) 1ST Treatment	.299	16.3	.0030	.0004	.0035	.0026	.0099	.0248	.0171	.0419	.0518	.0509	.0698
REFINED WATER GAS TAR-LIGHT-(Ugite) Retreatment.	.301	13.4	.0034	.0006	.0067	.0003	.0110	.0239	.0149	.0388	.0500		
ASPHALT CUTBACK 1ST Treatment	.346	17.5	.0057	.0021	.0061	.0042	.0181	.0420	.0188	.0618	.0789	.0738	.0868
ASPHALT CUTBACK Retreatment	.297	18.5	.0026	0014	.0057	.0039	.0136	.0309	.0223	.0532	.0677		

Gravel ——— Cost per 2000# delivered on road ——— 2.14
Trap Rock Chips — " " " " " " -1.749, 2.30, & 2.35 — Average 2.30
Tarvia A per gallon applied — .06½ Ugite Cold per gallon applied — .08
B " " " — .07 " Hot " " " — 09
Asphalt Cut Back per gallon applied — .11⅔

ALL CLASSES BITUMINOUS MATERIAL —
TOTAL SQUARE YARDS TREATED 1,034,470
TOTAL GALLONS APPLIED 334,377
TOTAL POUNDS COVERING MATERIAL 14,435,347
TOTAL COST $60,407.23

TABLE SHOWING DETAILS AND COSTS OF BITUMINOUS SURFACE TREATMENT WORK IN PHILADELPHIA, PA.

The question of cleaning is very closely related to all of our highway work and before very long it is going to be considered an important element in connection with our maintenance costs. Up to today we have never considered in the cost of maintenance of any of our pavements, roads, types of road surfaces, or any kind of pavement of any description, the cost of cleaning; and it is a most important factor. Some types of pavement which are less durable under certain traffic conditions cost so much less to clean that it is a question whether in the long run they would not be the most economical on certain streets. In this connection I might say that asphalt is the easiest pavement to clean. It, however, is not considered as good a pavement as granite block for heavy traffic streets, but I am not altogether sure when the cost of cleaning is added to the cost of maintenance of granite block pavements, particularly the old style of granite block which are gradually being eliminated, that the asphalt pavement would not be the cheapest in the long run.

An asphalt pavement will be less dusty with the same amount of cleaning than a wood block pavement. The dust will incorporate to a certain extent in an asphalt pavement, particularly in the warm weather, but it will not with a wood block pavement, after the bleeding is over, and this is usually the case after the second season. Most of our accidents from skidding result from improper cleaning of asphalt and wood block pavements. If these pavements are thoroughly cleaned with squeegees, there will be no scum on the pavement to cause machines to skid, and in this connection I am going to call your attention to a little detail that is one of the most important questions in street cleaning work. A number of men will state that machine broom cleaning is a thorough method for cleaning asphalt and wood block pavements. You cannot thoroughly clean a pavement with a machine broom. After cleaning you can go over the pavement and by observing very closely, you will see that where the broom has passed it has left little streaks of dust here and there, and if an automobile passes right over the road, you will find dust rising from it. When it rains on that dust a little scum forms that results in causing machines to skid. If you thoroughly scrub an asphalt, wood block or bituminous pavement, or any smooth pavement with a squeegee, and you observe the pavement very closely after the scrubbing, you will find no dust, simply because the rubber squeegee actually scrubs the whole pavement. And when the pavement is dry, within a very short time after it has been scrubbed, if a machine passes over it, you will not find any dust arising, nor a scum in wet weather from this little film of dust, which is always left on the pavement after machine broom cleaning.

The average cost of machine broom cleaning on heavy, medium and light traffic streets for the city of Philadelphia for 1914 was $0.269 per 1,000 sq. yds.

The average cost of squeegee cleaning on heavy, medium and light traffic streets for the city of Philadelphia for 1914 was $0.151 per 1,000 sq. yds.

These prices include the cost of the removal of the street dirt and the cost of operating and the direct supervision only, and are based on the following:

Foremen	$2.50 per 10 hour day
Gangmen	1.75 per 10 hour day
Machine broom	5.50 per 10 hour day
Dirt wagon	5.00 per 10 hour day
Two-horse sprinkler	5.00 per 10 hour day
Dirt cart	3.50 per 10 hour day
Squeeges	6.00 per 10 hour day

Summary of Discussion

Mr. Connell's paper was discussed informally by C. B. Scott, Assistant State Highway Commissioner of Virignia; Ezra Stoltzfus, of Gap, Pa.; R. A. Meeker, State Highway Engineer of New Jersey; C. B. Anderson, a contractor of Joplin, Mo., and V. Nicholson, an engineering chemist of Chicago, Ill., and by Mr. Connell, who replied to a number of questions asked by others who took part in the discussion.

In reply to Mr. Stoltzfus, who asked if anyone had had experience with lignin liquor, Mr. Meeker said that in the southern portion of New Jersey it had been used on gravel roads and that it had proven very satisfactory where there was a considerable percentage of clay in the gravel. He also said that it worked very well with red shale but that it did not work well with stone. According to Mr. Meeker, there must be some clay in the material when it is applied. He said that better results were obtained by several applications of a small amount than by one application of a large quantity.

In reply to a question by Mr. Anderson as to whether he had used cut-back asphalt on gravel roads, and if so what results he had secured, Mr. Connell replied that he had not used cut-back asphalt on gravel roads but he believed that with a good, clean gravel containing a considerable amount of sand it would work as well as with stone.

Mr. Nicholson asked if there were not considerable danger of explosion in the use of cut-back asphalt. Mr. Connell replied that there was a certain amount of danger but that he had seen a considerable amount of that material used and had known of a considerable quantity being used in other localities but had never heard of an accident.

The Road System of Batangas Province, Philippine Islands

The Province of Batangas is situated on the eastern coast of the Island of Luzon, about 40 miles south of Manila. It was one of the earliest parts of the island to be colonized and exploited by the Spaniards, and during the Spanish regime was exceedingly prosperous. Since the American occupation, the government engineers have been busily engaged there, as elsewhere in the Philippines, in the improvement of the roads and other public works.

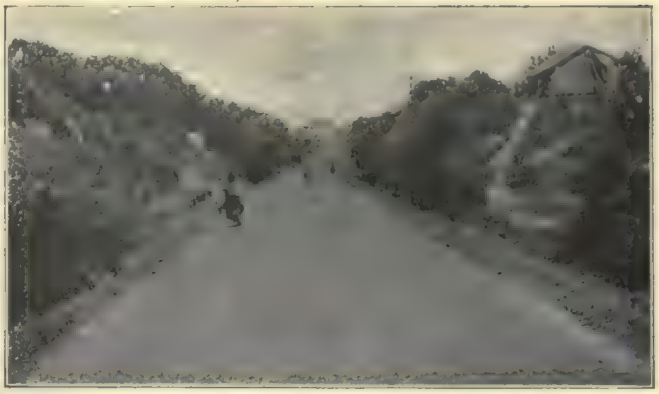
Frequent reference has been made in "Good Roads" to the highway work carried on by the Philippine Bureau of Public Works, and in the following paragraphs is given a brief resume of the activity in this particular province. The data and the illustrations are taken from an article entitled "Public Works, Old and New, in Batangas Province," by John C. Caton, 3d, District Engineer of that province, printed in a recent number of the "Quarterly Bulletin" of the Bureau of Public Works.

According to Mr. Caton, the road system of the province as laid out during Spanish days was remarkably complete. Practically all of the towns in the province were connected with each other by wide earth roads which were passable for wheel traffic during the dry season. Most of them could be used during the rainy season also, although with difficulty. In general, the roads were unsurfaced, and the greatest assets left by the Spaniards are said by Mr. Caton to be the rights of way, which are frequently of ample width and usually on alignments that it is difficult to improve. In spite of this, it was left for the American administration to build and maintain roads passable at all seasons of the year.

Suitable road building stone is not locally available for most of the work, but under the present administration stone has been imported by rail and by water, and a system of modern highways is now under construction. The illustration at the top of the opposite page shows the first crushed stone road built in the province—the Batangas-Bauan section of the Batangas-Nasugbu Road. This section, 7 kilometers (4.35 miles) in length, was built in 1907. The stone was broken by hand, hauled to the road by a heavy traction engine and laid without rolling. Mr. Caton

AN UNIMPROVED PHILIPPINE HIGHWAY.

ROCK CRUSHING PLANT, BATANGAS PROVINCE, P. I.



BATANGAS-NASUGBU ROAD, BATANGAS, P. I.

states that "It seemed almost a hopeless task to try to put down a broken stone road without a roller and with that traction engine tearing the stone loose every day, but the surfacing in the end became set up and bound so well that today the road is still in a most serviceable condition and has never needed to be resurfaced." It is stated that the latest traffic census showed a daily average of 703 vehicles of various types on this section of the road.

The present road building equipment of the province consists of a portable crushing plant (shown in the photograph at the top of this page), two wide-tired steam trucks with trailers, in addition to the bull carts, and three rollers.

All first-class roads are surfaced with crushed stone to a width of from 4 to 5 m. (13.1 to 16.4 ft.). They are built on well constructed subgrades and are maintained continuously in excellent condition. One of these modern macadam roads is shown in the illustration at the foot of this page. This is the Batangas-Manila Road and is said to be typical of the roads which are now being built. It is stated that the second-class roads have ample rights of way and are passable during the dry season, even for automobiles. The roads designated as third-class have narrow rights of way and because the important bridges along them have not been built, are practically impassable for automobiles at all times. The province has 87 kilometers (54.06 miles) of first-class roads under "caminero" maintenance (maintenance by "camineros" or patrolmen) and 123 kilometers (76.43 miles) of second-class roads under gang maintenance. There are also 167 kilometers (103.77 miles) of third-class roads in the province, besides a considerable mileage of trails.

The road building policy in the province has been to build roads from isolated towns to the nearest seaports or railroad stations, thus giving outlets to the commerce of the towns. This work has already progressed so far that the system is now practically a connected one, except for three comparatively short sections of second-class and third-class roads, which it is hoped will soon be completed.

One of the roads upon which work has been prosecuted during the past season is the Batangas-Ibaan Road, on which is located the Sabang Bridge, an illustrated description of which was printed in "Good Roads" for August 1. The construction of the Batangas-Ibaan Road was the first step in a project for connecting Ibaan, Rosario and Bolbok with the provincial capital and the railroad.

In regard to the bridges in the province, it is stated that they are unusual in their number, size and the variety of design, and in their permanence. They constitute, according to Mr. Caton, real monuments to the ability of the Spanish engineers who built them. All of the principal structures, it is stated, are still standing and are being maintained in good condition. On the main provincial roads there are 101 Spanish bridges and culverts. The American officials, besides maintaining these Spanish bridges and reconstructing those requiring it, have built 204 additional bridges and culverts of steel or reinforced concrete. It is stated that bridge construction has now progressed so far that the majority of streams on the first-class and second-class roads are spanned by permanent structures. When a few more bridges have been built, the bridge system will have been practically completed, and a considerable portion of the funds now used for bridge work will be available for the extension of the roads of the first-class.

IMPROVED CRUSHED STONE ROAD IN THE PHILIPPINES—THE BATANGAS-MANILA ROAD.

The Fourth Annual Road School of the Wisconsin Highway Commission

The Fourth Annual Road School of the Wisconsin Highway Commission was held at Madison, Wis., February 1 to 5. The attendance was 306, every county in the state being represented either by the county highway commissioner or a member of the county board of supervisors. Besides these officials, the attendance included members of the staff of the Wisconsin Highway Commission, city engineers, contractors and road foremen.

As the Legislature was in session at the time of the meeting, the sessions could not be held in the Capitol building, and the City Free Library was utilized. The program of the sessions consisted of addresses, the presentation of papers on various phases of road work and discussions. Most of the papers were presented by members of the staff of the State Highway Commission, and the discussions were led by especially selected speakers, who were, for the most part, engineers or officials of the State Highway Department or the county boards.

The fourth annual meeting of the Wisconsin County Highway Commissioners' Association was held in connection with the road school, on Wednesday, Feb. 3. The proceedings of this meeting consisted of a discussion of the details of management, equipment and other phases of highway work and a discussion of the state aid law and of the recommendations of the Wisconsin Highway Commission relative to changes in the law and amendments to it. The following county highway commissioners were elected officers for the coming year: President, Charles E. Moore, Rock County; Vice President, C. J. Morisset, Douglas County; Secretary and Treasurer, T. W. Humble, Langlade County.

The entertainmnent and social features of the road school comprised a smoker on the evening of Monday, Feb. 1, and the annual supper of the Wisconsin County Highway Commissioners' Association on the evening of Tuesday, Feb. 2. About 130 members attended the supper, at which County Highway Commissioner H. J. Kuelling of Milwaukee County, President of the Wisconsin County Highway Commissioners' Association during the past year, acted as toastmaster.

According to A. L. Luedke, Engineer of Surveys of the Wisconsin Highway Commission, to whom we are indebted for our information, the discussion brought out the following phases concerning Wisconsin practice:

"Location.—Proper location is the basis of success or failure in all steps of road improvement. No curve should have a radius of less than 100 ft. and a clear sight of less than 200 ft. No grades on finished surfaces should exceed 8 per cent. and 6 per cent. for brick and concrete. No velocity in road ditches should exceed 2 ft. per second, without providing paving.

"Drainage.—All drainage should be divided into surface, sub-surface and lateral drainage, and each given careful attention before surfacing is placed.

"No culverts should be less than 22 ft. long nor less than 18 ins. high, and provided in all cases with end walls high enough to protect traffic from getting in the ditches. The minimum fall on all culverts should not be less than 3 ins. on the inlet and all flows of culverts and small bridges should be protected with 6 ins. of fill below the surfacing.

"Earth Roads.—In all heavy grading work, it is necessary and essential to protect the bank slopes by planting and encouraging vegetation to grow on same as soon as possible. Staking out all grading, even road grader work, saves time and facilitates handling the material. In grading, carry the line down parallel to the finished grade and cut to a depth of 6 ins. below grade to allow for crowning.

"Gravel Roads.—Bank run gravel when used for surfacing should be analyzed and the proper amount of binding material added to bind the particles. Clay binder is a successful binder. Gravels should have at least 80 per cent. large stone to be a success in any gravel road. Gravel roads can be oiled or surface treated with asphaltic oils but should be allowed to be set before oils are applied. No sand is necessary to cover the oil after oiling gravel roads.

WISCONSIN ROAD BUILDERS AT THE ROAD SCHOOL OF THE STATE HIGHWAY DEPARTMENT.

"Concrete Roads.—Concrete roads should be very carefully cured. The wet or water method accomplished by placing small clay dams on the edges of the slab is most successful. In striking off the concrete, strike away from the joints and do not move the strike board too much longitudinally in each stroke. It costs no more to maintain unsurfaced joints than it does the armored joints. It is good practice to keep the mixer clean and not to allow the dumping of waste concrete behind any joint at the time work is stopped for any considerable length of time. In village work combine the curb and gutter with the pavement and make the curb and gutter of the same mix as the pavement, and make it monolithic. Carry expansion joints through the curb and gutter, and through the entire depth of the concrete. In floating, it is not necessary to go over the concrete surface very often to smooth it. The less it is floated the better it will withstand traffic. The subgrades for all concrete should be plowed up and rolled down uniformly to the entire width of the pavement.

"General.—The best work is secured in road camps, where the men are housed in good bunk wagons and where they are fed at the camp, close to the work. The average cost of feeding men is 20 cts. a meal. Considerable cost of roads can be saved by hauling in winter with sleighs. Portable barns and bunks are more satisfactory and cheaper than tents. All accounts should be checked up daily to carefully watch all unit costs and progress of the work."

One Cause of the "Inferiority" of City Pavements in America

In a lecture entitled "Some Causes of Bad City Pavements in America and Their Remedy," delivered at the recent road school at the University of Ohio, Professor Leonard S. Smith of the University of Wisconsin stated that "the marked inferiority of American city pavements as compared with those of European cities is certain to impress even the most casual traveler." He contends that an investigation will show that this inferiority is usually not due to a lack of knowledge or skill in design or construction, but is the result of several unwise customs.

These faulty customs, according to Professor Smith, who has charge of the Highway Engineering Department of the University of Wisconsin, are: (1) The selection of the wrong type of pavement; (2) the lack of a systematic paving and street improvement program; (3) a faulty city street plan; (4) inadequate inspection of construction, and (5) the general lack of an adequate system of pavement maintenance.

Professor Smith took up these five points and discussed them in detail. Space does not permit the utilization of the entire lecture, but from the paragraphs relating to the first point—that of selection—the following are printed in full:

"In view of past experience, it must be admitted that the custom of allowing the abutting property owner to decide the type of pavement for his street is wrong both in theory and practice. Such a choice is very likely to result in the rapid destruction of the pavement so selected because not suited for traffic conditions. In the end it is an unnecessary burden upon the shoulders of the general taxpayer because of the resulting high annual maintenance cost.

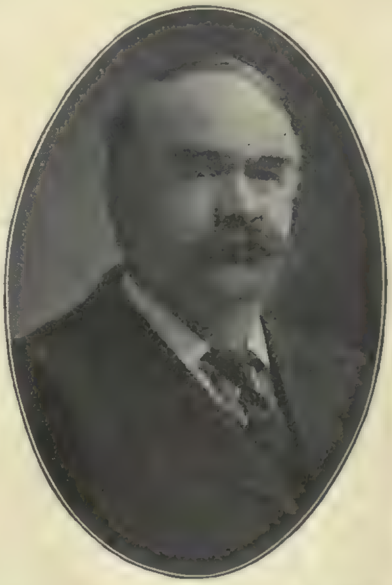
"Property owners who never would consider themselves qualified to decide the kind and size of sewers or the water pipes in front of their homes, strange to say, appear very confident of their ability to pass on the type of pavement suited to their own street. The fact that their interest in pavement matters is generally limited to their own street suggests that considerations for their own pocketbook alone form the basis of their expert knowledge. This is especially true where the property owner pays for the first pavement only and the city pays for all renewals and repairs. Under such circumstances the landowner is apt to select the cheapest pavement—that is the smallest first cost—even though the cost of maintaining such a non-suitable pavement be many times in excess of a reasonable charge. In some American cities excessive maintenance charges, due to this system of selection, have resulted in the practical abandonment of such pavements, so that they are soon full of holes.

"Then, too, a certain type of salesmanship possessed by some agents of paving material concerns has greatly stimulated the property owners' confidence in their expert knowledge, thereby greatly complicating the situation. Not infrequently the controversies aroused by the active solicitations of such agents have prevented a wise choice of pavement, with the result of bad pavement conditions. Obviously in the long run such agents are not serving even the best interest of the companies they represent.

"The speaker does not wish or intend to belittle the thorough-going and bona fide investigations of pavement matters by citizen organizations. In fact, under our democratic form of government such movements are of a real necessity for informing the general public and thereby securing its confidence and cooperation with the plans of the city government. The speaker is fully aware of the excellent results secured by this important type of team play between citizens and their chosen administrative officers. The best results in such cases, however, have been realized through the employment of experts by such citizen organizations to investigate the facts and report to the citizens their conclusions, with full statement of reasons. Some of these reports distributed in the form of bulletins have contributed greatly toward the cure of pavement evils by pointing out their proper remedy. We need more, not less, of this form of team play. The selfish practices which I am condemning are obviously so poorly calculated to serve the general welfare of the city that no one really attempts their defense. In fact, many cities select their pavements now on expert advice alone. Such cities have learned to put great weight upon the recommendations of their city engineer, based as they are upon large experience and adequate investigation. We can confidently expect that our growing vision of municipal efficiency will not much longer tolerate the old system of pavement selection by selfish interests."

Stoddard B. Bates, State Highway Commissioner of Vermont

Stoddard B. Bates, of Derby, Vt., has been appointed State Highway Commissioner of Vermont by Governor Charles W. Gates, the former commissioner, who was elected Governor at the election last November.



STODDARD B. BATES, STATE HIGHWAY COMMISSIONER OF VERMONT.

Mr. Bates was born in Newport, Vt., March 18, 1862, and has been a resident of Derby since 1870. He was educated in the public schools of that place and in Derby Academy. He has held several town offices, and from 1906 until his appointment as Commissioner, on January 1, of this year, served as County Supervisor of Highways of Orleans County. He also represented the town of Derby in the General Assembly of 1910-11, serving on the Committee on Highways and Bridges and on the Committee on Federal Relations, of which he was Chairman.

A Bond Issue of $50,000 for the construction of roads has been voted in the northern portion of DeWitt County, Texas. This is the first issue made for roads in the county.

A Large Road Bond Issue in Fresno County, California, is likely to be made in the spring, according to reports. It is stated that an election on an issue of $2,000,000 or $3,000,000 is to be submitted to the voters. Agitation for the improvement of the roads of the county, which was started by the Chamber of Commerce of Fresno, has been carried on for over a year.

AMERICAN ROAD BUILDERS' ASSOCIATION

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NEW YORK, N. Y.

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W. W. CROSBY, Baltimore, Md.

Through the courtesy of the publisher of "Good Roads," this page, each month, is devoted to the use of the American Road Builders' Association. It is solely in the interests of the Association, and it is the desire of the Executive Committee that all members feel that this space is their own, and that they contribute freely to it, not only as regards anything concerning the Association itself, but also that which will further the good roads movement. Besides the official announcements of the Association, there will appear on the page contributions by members, items of news concerning the Association activities and personal notes about its members. All contributions should be sent to the headquarters of the Association at 150 Nassau Street, New York, N. Y.

Executive Committee:
Geo. W. Tillson
R. A. Meeker
E. L. Powers

The Annual Meeting

The annual meeting of the Association was held at New York, N. Y., on the afternoon and evening of Friday, February 5. The meeting was called to order at the Hotel Astor in the afternoon immediately after a meeting of the Board of Directors, which was held at 2 o'clock. The business transacted included, besides the election of officers, the reception of the annual reports of the Secretary, the Treasurer and the Executive Committee, the reception of the report of the Committee on Standards and the report of the Committee on Legislation and a general discussion of different phases of the Association's activities.

The meeting was called to order by President W. A. McLean, who called upon Secretary E. L. Powers to read the reports of the Secretary, Treasurer and the Executive Committee. The reports of the Secretary and Treasurer covered the routine business of the Association for the past year. The report of the Executive Committee showed that during 1914 the Association had made a very substantial gain in membership, largely through the work of the Membership Committee, appointed on recommendation of the Executive Committee. The report also called attention to the satisfactory financial condition indicated by the reports of the Secretary and Treasurer.

In reference to the Eleventh Annual Convention, held in Chicago December 14 to 18, 1914, the report pointed out that the registration showed a larger attendance than at any previous meeting of the organization. It was added that it was believed to have been the largest gathering of those interested in road building ever held. The exhibition of machinery and materials and methods of construction and maintenance, according to the Executive Committee, occupied a larger space than anything of the kind ever held. There were 108 commercial exhibits, 6 State exhibits and 3 city exhibits, and, in addition, exhibits from the Office of Public Roads of the United States Department of Agriculture, and from the Province of Ontario, Canada. Reference was also made in the report to the model boulevard, and it was stated that although the work involved was very considerable it was felt that the result achieved warranted the small expenditure which this feature of the show made necessary.

In accordance with the action taken on the progress report of the Committee on Standards and the Committee on Legislation presented at the Chicago convention, these committees reported at the annual meeting. The report of the Committee on Standards, Nelson P. Lewis, Chairman, was brought before the meeting by Vice President George W. Tillson, and the report of the Committee on Legislation, W. A. McLean, Chairman, was read by Secretary Powers. On a motion by Mr. Tillson, it was voted that the report of the Committee on Standards be received and published in the annual "Proceedings" of the Association with a view to consideration at the next annual meeting, and on a motion by Prof. A. H. Blanchard it was voted that the report of the Committee on Legislation be received and printed for further discussion.

The report of the Committee on Standards, which is too long for presentation here, reviews first the work done by the committee. This portion of the report is, in part, as follows:

> Your committee has undertaken the work assigned to it in the belief that the members of the Association did not desire to have presented for its consideration highly technical specifications for the different classes of highway work. The preparation and the standardization of such specifications have been undertaken by various technical societies, such as the American Society of Civil Engineers, the American Society for Testing Materials and the American Society of Municipal Improvements; and your committee did not think it wise to attempt to duplicate the work which is thus being done but that it should confine itself to the presentation of certain rules and the initiation of certain standards for highway work which could be understood and complied with by foremen, inspectors, and the great number of men without special technical training who are engaged in the work of highway construction and maintenance in the various parts of the United States. Your committee has divided its work into seven different subjects, each of which was assigned to a separate sub-committee. Some of these sub-committees have prepared quite exhaustive reports while others have presented very little other than a few general observations. Our report will deal with the several subjects but without attempting a separate presentation of each, outlining first a few general principles which should govern all of those responsible for highway construction and maintenance from the head of the highway department to the humblest workman.

The remainder of the report covers the matter of standards under the following heads: General Rules, Field Tests of Materials Used in Road Making, Earth and Gravel Roads, Sand-Clay Roads, Instructions for Inspectors and Foremen Engaged in Maintenance and Repair Work, The Care of the Roadside, Dust Preventives.

The report of the Committee on Legislation covers the following phases of the subject: Object of Road Classification, Road Classification, Distribution of Control, Limitation of State or Provincial Control and Aid; Special Financial Provision for Main Roads, Bond Issues, Maintenance, Experienced Staff, Centralized Control, Urban Construction, Revenue from Motor Vehicles, Educational and Supervising

Authority, Labor Tax, Traffic Regulation. In the introductory paragraph of the report attention is called to the fact that the highway laws in no two countries or states are alike, and it is stated that in view of area and existing conditions with respect to road control, the committee recognizes the state legislatures of the United States and the provincial legislatures of Canada as being, for the purpose of its report, the authorities corresponding to national or central authorities in European countries. The main portion of the report sets forth, under the heads which have been noted, certain general principles which, in the committee's opinion, should be embodied in any general code of state or provincial laws.

Late in the afternoon a recess was taken, and at half past six most of those who had attended the afternoon meeting, other members who had not been able to be present, and guests assembled at Rector's for dinner. After dinner the meeting was called to order again for the reception of the report of the tellers. After this, brief addresses were made by W. A. McLean, the retiring President, who served as the toastmaster; George W. Tillson, the newly elected President; Past President James H. MacDonald, former State Highway Commissioner of Connecticut; H. M. Swetland, President of the Class Journal Co., New York, N. Y.; William H. Connell, Chief of the Bureau of Highways and Street Cleaning, Philadelphia, Pa.; R. A. Meeker, State Highway Engineer of New Jersey, and Frank D. Lyon, Secretary, Inter-State Stone Manufacturers' Association, Columbus, Ohio.

DINNER IN CONNECTION WITH THE ANNUAL MEETING OF THE AMERICAN ROAD BUILDERS' ASSOCIATION AT NEW YORK, N. Y., FEBRUARY 5.

Officers elected for 1915 are as follows: President, George W. Tillson, Consulting Engineer to the President of the Borough of Brooklyn, New York, N. Y.; First Vice Presiwent, A. W. Dean, Chief Engineer of the Massachusetts Highway Commission; Second Vice President, Austin B. Fletcher, State Highway Engineer of California; Third Vice President, S. Percy Hooker, State Superintendent of Highways of New Hampshire; Secretary. E. L. Powers, Editor "Good Roads," New York, N. Y.; Treasurer, Major W. W. Crosby, Consulting Engineer, Baltimore, Md.

Directors for three years were elected as follows: E. A. Fisher, City Engineer of Rochester, N. Y.; A. R. Hirst, State Highway Engineer of Wisconsin; Joseph W. Hunter, First Deputy Commissioner, Pennsylvania State Highway Department; Frank F. Rogers, State Highway Commissioner of Michigan; William R. Smith, General Manager of the Lane Constructon Corporation, Meriden, Conn., and H. M. Waite, City Manager of Dayton, Ohio.

A. R. B. A. Notes

Past President Nelson P. Lewis, Chief Engineer of the Board of Estimate and Apportionment of New York, N. Y., presented a paper on "City Planning," at the twenty-seventh annual meeting of the Iowa Engineering Society, held at Iowa City, Ia., February 17-19.

C. B. Scott, Assistant State Highway Commissioner of Virginia, was elected a member of the Executive Committee of the Virginia Road Builders' Association at its recent meeting. Mr. Scott was also one of the speakers at the meeting.

George C. Warren, President of the Warren Bros. Co., Boston, Mass., lectured on "Public Recognition of and Specifications for Patented Pavements," at Columbia University, New York, N. Y., on February 12, the lecture being one of those in the course delivered by non-resident lecturers before the students in the University's graduate course in highway engineering.

H. G. Shirley, Chief Engineer of the Maryland State Roads Commission, was one of the speakers at the recent meeting of the Virginia Road Builders' Association at Richmond, Va.

A. N. Johnson, formerly State Highway Engineer of Illinois and now Highway Engineer of the Bureau of Municipal Research, New York, N. Y., delivered a lecture on "Methods of Cost Keeping for Highway Engineers and Contractors," before the students in the graduate course in highway engineering at Columbia University on the evening of February 5.

Arthur H. Blanchard, Professor of Highway Engineering at Columbia University, New York, N. Y., delivered an illustrated lecture on "Economic Phases of Highway Engineering" before the Middletown Scientific Association at a meeting at Wesleyan University, Hartford, Conn., on Feb. 9. On Feb. 11, Prof. Blanchard delivered an address on "The Highway Engineer in Public Life," at the annual meeting of the Engineers' Society of Northeastern Pennsylvania.

Among those who took part in the road institute held at the University of North Carolina, Chapel Hill, N. C., February 23-27, mention of which was made in "Good Roads" for February 20, were the following A. R. B. A. members: Treasurer W. W. Crosby, Consulting Engineer, Baltimore, Md.; R. T. Brown, Highway Engineer, Chapel Hill, N. C.; R. T. Coble, Highway Engineer of Lee County, North Carolina; W. S. Fallis, Highway Engineer of Vance County, North Carolina; Dr. Joseph Hyde Pratt, State Geologist of North Caroline; S. D. Scott, Highway Engineer of Warren County, North Carolina; R. E. Snowden, Highway Engineer of Craven County, North Carolina, and D. H. Winslow, of the U. S. Office of Public Roads.

LETTERS TO THE EDITOR

An International Road Congress in the United States

The fourth session of the International Association of Road Congresses has been scheduled for Munich in 1916, and it seems not improbable, under all the conditions existing and to be expected then and in the meantime, that the holding of the congress according to the plans will be found impracticable. It would seem unfortunate to have the next congress given up, or even delayed. The recent and imminent developments in the science and art of highway engineering argue against the latter alternative, and surely few, if any, of those interested in the subject would but deplore the dissolution of the International Association.

Would it not be possible, in view of the conditions above referred to and considering the danger to the International Association itself from any indefinite postponement of the 1916 congress, for the United States to take up the matter of holding the Fourth Session of the International Congress in Washington or New York City instead of in Munich? Possibly such a proposition would be welcomed by a large number of members of the International Association as well as by highway authorities in the Western Hemisphere, and it surely ought to be possible, if a start is made promptly, and the change of location of the meeting agreed upon shortly, to at least equal here the successful meetings previously held in Paris, Brussels and London.

Possibly this suggestion is worthy of consideration by your readers and perhaps by the American Road Builders' Association.

W. W. CROSBY, C. E.

Baltimore, Md.

The Municipal Bond Market

Editor "Good Roads:

I have just returned from a two months' trip through the West and the South, during which the bond situation in its application to country road and city street development was given special consideration at the several points visited.

It is undoubtedly a fact that, owing to the general financial stringency prior to and intensified by the sudden outbreak of the war, every form of investment has been through a depressed condition. My observation, however, is that at the present time there is not only a marked improvement, but I believe that investors and the public generally are coming more and more to appreciate that municipal securities are one of the safest investments and perhaps the safest form of investment bearing a reasonable rate and assurance of income.

I believe the time is rapidly approaching when investors will put less money in railroad and other industrial securities and also that the public, which now invests in comparatively small amounts, but in the aggregate in large amounts in savings banks, is coming to realize that they can have no safer or better investment than in municipal securities, including assessment certificates in their home cities.

GEORGE C. WARREN,
President, Warren Brothers Co.

Boston, Mass.

NEWS NOTES

During Last Year 9.65 Miles of Pavement were Built in the City of Syracuse, N. Y., at a total cost of $564,419.94, according to a recent report by City Engineer Wooley. In addition, 1.10 miles of pavement were resurfaced, 3.6 miles of unimproved streets were graded and 8.8 miles of sidewalks were built.

Statistics on Fatal Accidents at Railroad Crossings are contained in the report of the National Highways Protective Society for 1914. According to the figures given there, the number of persons killed in railroad crossing accidents during 1914 was 199, as compared with 124 for 1913 and 107 for 1912. Of those killed in 1914, 133 were pedestrians, 35 were occupants of motor cars and 31 were occupants of wagons.

The Amendment of the Highway Law of New York to provide for the election of town superintendents of highways for terms of four years instead of two was recommended in the annual report of County Superintendent Howard, of Oswego County, New York. According to Superintendent Howard, the election of a town superintendent every two years and his removal by the town board seems to be one of the weakest points in the highway law. He points out that a man with no experience is frequently elected and that by the time he has acquired the necessary knowledge and experience for the performance of his duties his term has expired or is at least half over. He also states that with the removal of the town superintendent in the hands of the town board it is practically impossible to secure the removal of an incompetent superintendent, and suggests as a remedy for this that the power of removal be vested in the State Highway Commission instead of in the town officials.

The Work of the Paving Commission of Baltimore, Md., since it begain its operations on Jan. 1, 1912, has included the improvement of about 85 miles of streets, 30 ft. in width between curbs, according to a recent statement. The majority of the paving laid by the commission has been sheet asphalt. During 1913 the commission laid about 553,000 sq. yds. of improved pavement, or approximately 31 miles. This work included the construction of about 323,000 sq. yds. of asphalt paving, 125,000 sq. yds. of vitrified brick paving, 71,000 sq. yds. of granite block paving, 13,500 sq. yds. of bituminous concrete paving, 10,000 sq. yds. of cement concrete paving, 8,500 sq. yds. of scoria block pavement and 2,000 sq. yds. of wood block pavement. Since the beginning of the Annex improvement work in 1906, the Commissioners for Opening Streets have laid over 64 miles of pavement. Of this total, 17 miles were laid in 1914. The work in the Annex last year also included the completion of 250,000 cu. yds. of grading.

MEETINGS

Massachusetts Highway Association

The annual meeting of the Massachusetts Highway Association was held at the American House, Boston, Mass., on Thursday, February 11, with an attendance of 236.

The business of the meeting consisted of the reception of the reports of the Secretary and the Trasurer and the election of officers. The report of the Secretary showed a membership of 321, and 9 new members were elected at the meeting. The report of the Treasurer showed a bank balance of $1,275. The business meeting was followed by a dinner, presided over by William D. Sohier, Chairman of the Massachusetts Highway Commission. Among the guests at the dinner were Mayors George M. Wright of Worcester, Thomas F. Kearns of Waltham, Thomas F. Halloran of Marlboro, Herman A. MacDonald of Beverly, M. J. W. Fish of Taunton, Chester I. Campbell of Quincy and Frank E. Stacy of Springfield.

Officers for 1915 were elected as follows: President, Frederick H. Clark, Superintendent of Public Works and of Engineering, Springfield; Vice President, John A. Williams, of Simpson Brothers, contractors, Boston; Secretary, John M. McCarthy, of Natick; Treasurer, Charles A. Brown, Superintendent of Streets, of Wellesley; Directors, Henry A. Spates, Superintendent of Streets of Winchester, and John A. Gaffey, a contractor, of Medford.

Texas Good Roads Association

The annual mid-winter meeting of the Texas Good Roads Association was held at Austin, Tex., February 2 and 3.

The sessions were held in the auditorium of the State University, and the first speaker was Dr. W. J. Battle, Acting President of the University. Other speakers at the morning session on Tuesday, February 2, were Governor James E. Ferguson, of Texas; Mayor A. P. Woodridge of Austin; former Senator John G. Willacy, of San Antonio, and President John W. Warren of the Texas Good Roads Association. In the afternoon a school of instruction was held under the direction of George D. Marshall, U. S. Highway Engineer. At the evening session, addresses were made by Dr. William B. Phillips, Director of the Bureau of Economic Geology and Technology at the University, who spoke on the "Testing of Materials for Road Construction," and George N. Denton, County Judge of McLennan County, who spoke on "The Need of a Uniform Road Law and a Highway Commission for Texas." D. E. Colp, of San Antonio, Assistant Secretary of the Association, also submitted his annual report.

The morning session on Wednesday, Feb. 3, consisted of a school of instruction similar to that held on the first day and, like the first one, was in charge of Mr. Marshall. At the afternoon session, J. P. Nash, Testing Engineer in the Bureau of Economic Geology and Technology of the University, read a paper entitled "Road Making Materials in Travis County," and W. A. Crossland, the U. S. Engineer in charge of the construction of the Austin-San Antonio Post Road, made an address describing the plans for that work.

The association voted to hold its mid-summer meeting at the Agricultural and Mechanical College, provided the County Judges' Association would agree to meet with them. Officers were also elected, President John W. Warren being reelected for another year, and Homer D. Wade, Secretary, being succeeded by D. E. Colp, of San Antonio, formerly Assistant Secretary. Mr. Colp was succeeded as Assistant Secretary by Walter Beck, of Fort Worth.

Among the resolutions adopted at the meeting were the following: A resolution favoring the creation of a state highway department; another favoring a uniform county road law for the state; another favoring the levying of a graduated wheel tax throughout the state; another recommending to the county commissioners' courts of the various counties the establishment of county highway engineering departments, in charge of men trained in highway work; another urging the placing of sign-boards on the roads of the state, and another urging the more careful examination of bridge plans and specifications, with a view to securing better bridges. Resolutions were also adopted thanking those who had cooperated in the holding of the meeting.

National Brick Manufacturers' Association

The twenty-ninth annual convention of the National Brick Manufacturers' Association was held at the Hotel Statler, Detroit, Mich., February 15 to 20. In conjunction with this convention, conventions were held by the National Paving Brick Maufacturers' Association, the American Ceramic Society and the National Clay Machinery Manufacturers' Association, affiliated organizations.

The sessions of the National Brick Manufacturers' Association were held on the afternoon of Wednesday, February 17, on the forenoon and afternoon of Thursday, February 18, and on the afternoon of Friday, February 19. In addition to these sessions, Tuesday evening was devoted to an informal reception and musical entertainment followed by addresses on the subject of roads. Among the speakers was Stanley McMicheal, Secretary of the Cleveland (Ohio) Real Estate Board, who described the excellence of the brick roads radiating from that city. On Wednesday evening there was a reception and "smokerette," and on Thursday evening the annual banquet of the association was held at the Hotel Statler.

Arizona Good Roads Association

The annual meeting of the Arizona Good Roads Association was held at the Chamber of Commerce, Phoenix, Ariz., on Friday and Saturday, February 5 and 6, and was attended by delegates from most of the counties in the state.

Most of the time of the meeting was devoted to a discussion of road legislation. A committee composed of one member from each county represented was appointed to consider the several proposed measures, and, as a result of the meeting, it was decided to make the following recommendations to the Legislature: That Arizona's state highway system be administered by a non-partisan highway board, consisting of three members, cooperating with the State Engineer and independent of the Board of Control; that an annual appropriation of $400,000 be made for the construction and maintenance of state and county highways for the next two years, and that convicts be employed in the construction of roads when practicable, $5,000 per month being set aside for the performance of this work.

Officers for the coming year were elected as follows: President, D. B. Heard; Vice Presidents, J. J. Bowen, Gustave Becker, George W. P. Hunt, Harold Steinfeld, M. J. Cunning and H. H. Donkersley; Secretary, Harry Welch; Directors, Fred Colton, John W. Francis, J. M. Sparks, George A. Foote, Sam Abrams, P. Rose, Oscar Walker, W. A. Moeur, Harry Karns, M. Drachman, W. Y. Price, A. J. Eddy, William Stephens and W. Clark.

American Concrete Institute

The eleventh annual convention of the American Concrete Institute was held at the Auditorium Hotel, Chicago, Ill., on Tuesday, Wednesday, Thursday and Friday, February 9, 10, 11 and 12. On Monday, February 8, there was a meeting of the Board of Direction and meetings of the various sectional committees of the institute. Forenoon, afternoon and evening sessions were held on Tuesday, Wednesday and Thursday and forenoon and afternoon sessions on Friday, the evening of Friday being given over to the annual banquet. The sessions of particular interest to road builders were the three on Tuesday.

The first session was called to order by President Humphrey shortly after 10 o'clock, Tuesday morning, Feb. 9. The welcome to the city was extended by L. E. McGann, Commissioner of Public Works of Chicago, who represented Mayor Harrison. Commissioner McGann was followed by Secretary Percy H. Wilson of the Association of American Portland Cement Manufacturers, Philadelphia, Pa., who gave "A Review of Present Practice in Concrete Road Construction," the address being illustrated with stereopticon views. A paper on "The Service Test Concrete Road in Philadelphia," written by William H. Connell, Chief of the Bureau of Highways and Street Cleaning of Philadelphia, Pa., was read by Assistant Secretary Fish of the American Concrete Institute, Mr. Connell not being present. This was followed by a paper on "Reinforcing Narrow Concrete Roads," presented by John Mueller, a civil engineer of Newcastle, Ind.

The first paper of the afternoon session, "Cost of Construction and Maintenance of Concrete Roads," was presented by H. J. Kuelling, County Highway Commissioner of Milwaukee County, Wisconsin. Mr. Kuelling was followed by Charles E. Russell, City Engineer of Highland Park, Ill., who presented a paper on "The Construction of Integral Curbs," and by Percy H. Wilson, whose paper was entitled "Compartive Cost of Concrete Roads." The papers by Mr. Russell and Mr. Wilson were illustrated by stereopticon views. The last paper of the session, "Concrete Roads and Frost Action," by Andrew M. Lovis, First Assistant Engineer, Massachusetts Highway Commission, was read by Assistant Secretary Fish. After the reading of this paper, William M. Kinney presented the report of the Committee on Concrete Roads.

At the evening session, the first paper was presented by E. B. McCormick, Mechanical Engineer, United States Office of Public Roads. The paper, which was entitled "Test of a Reinforced Concrete Slab Bridge," was illustrated by stereopticon views. Mr. McCormick was followed by Nathan C. Johnson, of the Raymond Concrete Pile Co., of New York, N. Y., who gave an illustrated lecture on the "Microscopic Study of the Hydration of Portland Cement," and by C. B. McCullough, Designing Engineer of the Iowa State Highway Commission, who gave an illustrated talk on "Standard Designs for Concrete Highway Bridges and Culverts."

At the morning session on Wednesday, the first matter taken up was the report of the committee on Standard Specifications for Concrete Highways, Bridges and Culverts, which was presented by Willis Whited, Bridge Engineer of the Pennsylvania State Highway Department, Chairman of the committee. This was followed by the report of the Committee on Concrete and Reinforced Concrete, presented by Chairman A. E. Lindau.

At the afternoon session on Wednesday, F. C. Wight, Chairman of the Committee on Nomenclature, presented the report of that committee. This concluded the committee reports and papers of interest to road builders.

On Friday evening the annual banquet was held at the Auditorium Hotel. Douglas Malloch acted as toastmaster, and speeches were made by Albert Reichmann, Past President of the Western Society of Engineers; Henry Walter Graham; Richard L. Humphrey, President of the institute, and others.

On Thursday forenoon a business session was held, at which officers for the coming year were elected as follows: President, Leonard C. Wason, President of the Aberthaw Construction Co., Boston Mass.; Vice Presidents, W. K. Hatt, Professor of Civil Engineering, Purdue University, Lafayette, Ind., and H. C. Turner, President of the Turner Construction Co., New York, N. Y.; Treasurer, Robert W. Lesley, Philadelphia, Pa.; Directors, William H. Ham, Boston, Mass.; Ernest Ashton, Chicago, Ill.; A. E. Lindau, Chicago, Ill., and William P. Anderson, Cincinnati, Ohio.

Eighth Chicago Cement Show

The Eighth Chicago Cement Show was held under the auspices of the Cement Products Exhibition Company at the Coliseum, Chicago, Ill., February 10-17.

According to reports, the show was one of the most successful yet held, all the available space being taken and the exhibitors reporting many sales. As usual, a number of conventions were held at Chicago during the show, the principal one, from the road builder's point of view, being the meeting of the American Concrete Institute. Drawings for space at the 1916 show were made during the convention—a plan adopted this year for the first time.

Good Roads Conference at the Oregon Agricultural College

A meeting designated as the County Judges' and Road Supervisors' Conference was held on February 1 and 2, during Farmers' Week, at the Oregon Agricultural College, Corvallis, Ore.

On the first day addresses were made by Professor R. D. Hetzel, Director of the Extension Service of the college; G. V. Skelton, Professor of Highway Engineering at the college; Robert Kyle, a road supervisor of Benton County, and Professor G. W. Peavy. An inspection of the road materials testing laboratory of the college occupied the afternoon on Monday, February 1. In the evening an informal discussion of road topics was held in the rooms of the Civil Engineering Department. Among the topics taken up were the road bills before the legislature, drainage, and timber preservation. At the Tuesday session addresses were made by Judge Thompson of Lane County, City Engineer C. R. Beardsley of Corvallis, Professor Skelton, Judge McKnight of Linn County, Professor Graf, head of the Experimental Engineering Department of the college, and Professor R. E. Edgecomb.

Illinois Society of Engineers and Surveyors

The thirtieth annual meeting of the Illinois Society of Engineers and Surveyors was held at the Leland Hotel, Springfield, Ill., on January 27, 28 and 29.

The program, as was noted in "Good Roads" for January 16, included the following papers on road and street work: "Paving Practice at Springfield," by W. D. Seeley; "Burned Shale for Paving in Parks," by George L. Harnsberger; "Creosoted Wood Block Paving," by L. D. Jeffries; "The Design of Pavements," by H. L. Fixmer; "A Street Having Only One Gutter," by W. G. Kirchoffer; "Vertical Fiber Shallow Brick for Paving," by G. E. Johnson; "Integral Curbs for Concrete Pavements," by C. M. Powell; "Economics of Brick and Concrete for Roads," by H. E. Bilger; "Brick Paving for Rural Highways," by R. L. Bell; "Concrete Road at Marquette Hill," by B. H. Piepmeier; "Common Defects in Concrete Road Construction," by A. H. Hunter; "Effect of Dry Weather on Macadam Roads," by Benjamin Jordan. The Committee on Roads and Pavements also presented its report.

In addition to the sessions, the meeting included a smoker at the Leland Hotel tendered by the Springfield Engineers' Club; the annual dinner of the society, and an inspection of the plant of the Springfield Paving Brick Co.

Officers for 1915 were elected as follows: President, W. S. Shields, of Chicago, Ill.; Vice President, Paul Hansen, of Urbana; Trustees: B. H. Piepmeier, Assistant Engineer, Illinois State Highway Commission, and H. L. Fixmer.

Virginia Road Builders' Association

The fourth annual meeting of the Virginia Road Builders' Association was held at the Auditorium, Murphy's Hotel, Richmond, Va., on Tuesday and Wednesday, February 9 and 10.

Among the speakers on the program were State Highway Commissioner G. P. Coleman of Virginia; Col. Lucius Gregory, Member of the Board of Supervisors of Mecklenburg County, Virginia; Chief Engineer H. G. Shirley of the Maryland State Roads Commission; C. B. Scott, Assistant State Highway Commissioner of Virginia; Z. G. Durfey, Superintendent, Virginia State Highway Commission; A. H. Pettigrew, Assistant Engineer, Virginia State Highway Commission; C. S. Reeve, Assistant Chemist, U. S. Office of Public Roads; S. L. von Gemmingen, Assistant Engineer, Virginia State Highway Commission, and C. D. Snead, Bridge Engineer, Virginia State Highway Commission.

Officers for the coming year were elected as follows: President, State Highway Commissioner George P. Coleman of Virginia; Vice President, Col. Lucius Gregory, Member of the Board of Supervisors of Mecklenburg County, Virginia; Secretary and Treasurer, S. L. von Gemmingen, Assistant Engineer, State Highway Commission. Members of the Executive Committee were elected as follows: G. P. Coleman, C. B. Scott, Z. G. Durfey and Edwin Gibson.

The annual meeting of the South Dakota Good Roads Association was held on the evening of February 12 at the City Hall, Aberdeen, S. D. The speakers were Chas. McCaffree, State Immigration Commissioner, and J. W. Parmley, President of the Twin Cities-Aberdeen-Yellowstone Park Trail. Mr. McCaffree lectured on South Dakota and Mr. Parmley on the Trail. Both lectures were illustrated by lantern slides.

The Bucks County (Pennsylvania) Good Roads Association held its annual meeting at Doylestown, Pa., on February 22. The organization consists of the township supervisors of the county, and the meeting was devoted to the discussion of matters affecting those officials. Among the speakers was First Deputy State Highway Commissioner Joseph W. Hunter of Pennsylvania. Officers for the coming year were elected as follows: President, J. H. Buckman, of Langhorne; Vice Presidents: Morris P. Hallowell, of Ivyland, and Pierce F. Weirbach, of Ottsville; Secretary, Dr. H. W. Johnson, and Treasurer, Benjamin L. Kohl, of Revere.

The annual meeting of the Venango County (Pennsylvania) Road Supervisors' Association was held at the Court House at Franklin, Pa., on February 19. The meeting was devoted to the transaction of routine business, the election of officers for the coming year and to addresses and discussions. Among the speakers was First Deputy Commissioner Joseph W. Hunter of the Pennsylvania State Highway Department, who delivered an illustrated lecture. Officers for the coming year were elected as follows: President, C. C. Ramsdale, of Sandycreek; Vice President, J. W. Monjar, of Cranberry; Second Vice President, G. T. Phipps, of Clinton; Secretary, J. B. Porter, of Clinton, and Treasurer, S. T. Klingler, of Rockland.

The Good Roads Association of Asheville and Buncombe County (North Carolina) held its annual meeting at the City Hall, Asheville, N. C., February 17. The meeting was devoted to the reception of the reports of the officers, the election of officers for the coming year and a discussion of the future work of the association. The officers who have served during the past year were reelected as follows: President, E. C. Chambers; Vice President, Dr. C. P. Ambler; Secretary-Treasurer, B. M. Jones; Directors: F. Stikeleather, Dr. Justin Wohlfarth, W. B. Valentine, Dr. M. H. Fletcher, Major J. E. Rankin and Dr. Carl V. Reynolds.

A meeting of the Big Sandy Good Roads Association was held at Ashland, Ky., on February 18. Among the speakers were Mayor Salisbury of Ashland; E. B. Hager, of Ashland; H. C. Sullivan, of Louisa; Robert E. Woods, of Louisville, a director of the Kentucky Good Roads Association; O. M. Clark, of Philadelphia, Pa.; State Commissioner of Public Roads Robert C. Terrell of Kentucky. Officers for the coming year were elected as follows: President, Judge H. H. Stallards, of Pikeville; Vice Presidents: H. C. Sullivan, Judge J. H. Wade, Judge B. C. May and Judge Fred Vaughan; Secretary, Glenn Mott, of Catlettsburg; Assistant Secretary, B. F. Forgey, of Ashland.

COMING MEETINGS

March 9-12.—Michigan Good Roads Association.—Seventh Annual Convention, Grand Rapids, Mich. Secretary, A. A. Anderson, Hastings, Mich.

March 22-26.—Dominion Good Roads Association and Ontario Good Roads Association.—Second Canadian and International Good Roads Convention, Convocation Hall, Toronto, Ontario, Canada. Secretary-Treasurer, George A. McNamee, 909 New Birks Bldg., Montreal, P. Q., Canada.

March 24-25.—Florida State Good Roads Association.—Annual Convention, St. Petersburg, Fla. Secretary, J. P. Clarkson, Jacksonville, Fla.

BOOK NOTICE

STRUCTURAL ENGINEERING, by J. E. Kirkham, Professor of Structural Engineering, Iowa State College, and Consulting Bridge Engineer, Iowa State Highway Commission. Cloth; 6x9 ins., 660 pp.; 432 illustrations. Myron C. Clark Publishing Co., 608 South Dearborn St., Chicago, Ill. $5.00.

Although devoted principally to the general principles of structural engineering, there are several chapters on bridges, among them one on the design of simple highway bridges. This chapter, which occupies 34 pages, contains, besides the discussion of the design of highway bridges in general, specifications for highway bridges and discussions on the design of various types, including beam bridges, pony truss bridges and through truss bridges.

About $38,000 Has Been Expended in Frederick, Md., during the past year for street work. This figure includes the salaries of all the employees and superintendents.

The Expenditures of the City Engineering Department of Columbus, Ohio, during 1914 amounted to $1,682,202.23, according to a recent report by Chief Engineer Henry Maetzel. This work included paving, sidewalk construction, sewer installation and viaduct work.

Paving Work in Omaha, Neb., in 1914, included the construction of about 7 miles of paving at a total cost of $180,500, and new curbing costing $40,000. Of the 7 miles of pavement laid, 3½ miles were of asphalt. At the close of 1914 there were 156 miles of paved streets in the city.

NEW PUBLICATIONS

ON THE YELLOWSTONE TRAIL; First Year Book of the Twin Cities—Aberdeen-Yellowstone Park Trail.—Paper; 12x9 ins., 96 pp.; illustrated.

This year book includes a description of the Yellowstone Trail, which is described as starting at the Twin Cities and extending to Seattle via Aberdeen and Yellowstone National Park; a report of the annual meeting held at Mobridge, S. D., February 20, 1914; a report of the meeting held at Hunters Hot Springs, Mont., August 5 and 6, 1914; descriptions of various trails and of roads along the "Yellowstone Trail;" maps of the trail, and other matter. The book is profusely illustrated by road and other scenes in the states traversed by the trail.

PROCEEDINGS OF THE GOOD ROADS INSTITUTE AT THE UNIVERSITY OF NORTH CAROLINA; held March 17-19, 1914; Economic Paper No. 39, North Carolina Geological and Economic Survey.—Paper; 7x10 ins., 117 pp.; illustrated.

The proceedings of the good roads institute held at the University of North Carolina in March of last year comprise the resolutions adopted at the institute, the papers presented, contract forms, including specifications for various kinds of roads, and report forms. There is also included in the publication a list of the publications of the North Carolina Geological and Economic Survey. The illustrations consist of a group picture taken at the institute, drawings illustrating the papers and photographs of unimproved and improved roads.

PENNSYLVANIA STATE HIGHWAY DEPARTMENT, BUREAU OF TOWNSHIP HIGHWAYS; Bulletin No. 9, "Specifications for Culverts and Short Span Concrete Bridges," Issued by the Bureau for the Information of Township Supervisors.—Paper; 6x9 ins., 20 pp.

The contents of this bulletin comprise the following: "Form of Advertisement," "Information for Bidders," "Proposal," "Bond," "Specifications" and "Articles of Agreement." These forms, according to the prefatory note, are for use in connection with plans furnished by the Bureau of Township Highways and are to be distributed among prospective bidders on road work. The township supervisors letting work are to fill out three copies of the bulletin to correspond with the original copy of the successful bidder and forward the original and the three copies to the Bureau of Township Highways for approval. After approval, one copy is sent to the supervisors, one to the contractor, one to the superintendent of the district and the fourth is filed in the office of the State Highway Department.

HIGHWAY BONDS; A Compilation of Data and an Analysis of Economic Features Affecting Construction and Maintenance of Highways Financed by Bond Issues, and the Theory of Highway Bond Calculations; by Laurence I. Hewes, Chief, Economics and Maintenance, Office of Public Roads, United States Department of Agriculture, and James W. Glover, Professor of Mathematics and Insurance, University of Michigan, Ann Arbor, Mich., and Collaborator, United States Office of Public Roads; Bulletin No. 136 of the United States Department of Agriculture; Issued February 12, 1915.—Paper; 6x9 ins., 136 pp.; illustrated.

This bulletin comprises a discussion of highway bonds and four appendices. Appendix A comprises a tabular statement of state highway bonds voted up to 1914; Appendix B consists of tabular statements showing the amounts of highway and bridge bonds voted to January 1, 1914, in the counties, districts and other subdivisions of the various states; a tabular statement showing county, district and township highway and bridge bonds voted in 1912 and 1913 in the various states, together with the term and the rate of interest; statements showing the miles of road built and planned in counties, districts, beats and townships in the various states, and similar matter; Appendix C consists of tables showing the cost elements of gravel, macadam and bituminous macadam roads in Maine, Massachusetts and New Jersey; Appendix D is a discussion of the theory of interest as applied to highway bond calculations, and contains also sinking fund, annuity and interest tables for 60 years at 14 different rates of interest. The illustrations consist of reproductions of photographs of good and bad roads, maps, charts and the like.

REPORTS

PENNSYLVANIA STATE HIGHWAY DEPARTMENT; Report of State Highway Commissioner Edward M. Bigelow to Governor Tener for the period June 1, 1913, to June 1, 1914.—Cloth; 6x9 ins., 60 pp.; illustrated.

This report consists largely of tables showing details of the operations of the State Highway Department during the period covered by the report. The text also includes brief summaries of various phases of the work, including the surveying and plotting of state highway routes, surveys for county maps, maintenance, the work of automobile registration, the township road fund and the turnpike purchase fund. The report is profusely illustrated by excellent full-page halftones showing improved roads and roads under construction.

INDIANA HIGHWAY COMMISSION; Report to Governor Samuel M. Ralston, dated December 26, 1914. Paper; 6x9 ins., 12 pp. SUPPLEMENTARY ABSTRACT OF PAPERS AND RESOLUTIONS RECEIVED BY THE INDIANA HIGHWAY COMMISSION. Paper; 6x9 ins., 14 pp.

Of these two pamphlets, the first mentioned contains only the report of Messrs. Addison C. Harris, Thomas Taggart, Leonard F. Clore, William H. O'Brien and R. L. Sackett, members of the Indiana Highway Commission, to Governor Ralston. The second pamphlet contains Governor Ralston's message to the General Assembly regarding roads; a chapter entitled "What A State Road Department Could Do For Indiana," in which is included a resume of the meetings held by the State Highway Commission in the several congressional districts of the state, and a resume of resolutions received by the Highway Commission from various state organizations.

NATIONAL ASSOCIATION OF CEMENT USERS; Proceedings of the Eighth Annual Convention, held at Kansas City, Mo., March 6-11, 1912, together with Lists of Officers, Charter, By-Laws, Report of Executive Board, Minutes of Meetings of Executive Board, etc. Cloth; 6x9 ins., 820 pp.; illustrated.

The principal contents of this report comprise the papers, discussions and committee reports of the Eighth Annual Convention of the National Association of Cement Users, including the following of particular interest to road builders: "Concrete Highway Bridges," by W. S. Gearhart, State Engineer of Kansas; "Concrete Bridges," by Daniel B. Luten, Consulting Engineer, Indianapolis, Ind.; "An Improved Concrete Pavement," by E. W. Groves, City Engineer of Ann Arbor, Mich.; "Cement Paving as Constructed at Mason City, Iowa," by F. P. Wilson, City Engineer of Mason City, Ia., and the report of the Committee on Roadways, Sidewalks and Floors, which includes proposed revised standard specifications for Portland cement sidewalks, for concrete roads and street pavements and for concrete curb and concrete curb and gutter. The report is printed on paper of excellent quality and is profusely illustrated by reproductions of photographs and drawings, some of the latter being printed as insets.

A Bond Issue of $100,000 has been Voted in Corpus Christi, Tex. The money will be expended for the continuation of paving work in the city. It is stated that about 100 blocks, or 7 miles of street, will be paved. This issue of bonds makes the total amount of bonds issued during the past two years for street paving $250,000. The issue carried by a vote of 414 to 30,

NEW MACHINERY AND APPLIANCES

Two-Speed Sprinkler and Sweeper

In the accompanying illustration is shown a new piece of street cleaning equipment which has recently been put on the market.

The machine consists essentially of a steel frame carrying a revolving brush and water tank, together with operating mechanism for the brush and sprinkling apparatus. The broom is reversible and revolves in ball and socket joints and is covered with a sheet iron housing. The tank, which is mounted as shown in the illustration, discharges through two perforated pipes, placed just ahead of the broom, which can be operated separately or together. The tank is fitted with a hose connection for filling and with an overflow pipe. The pressure of the broom on the pavement may be regulated by adjustable weights, and the broom can be operated at either of two speeds.

A lever for raising or lowering the broom and another for throwing it in or out of gear are placed within easy reach of the driver's seat. Valves controlling the spray are also operated from the seat.

The special claim made for the machine is that the two speeds at which the broom can be operated make it possible to run the broom at high speed after it begins to wear out, thereby retaining the effectiveness of a broom of full diameter. It is also claimed that the higher speed is particularly effective in removing heavy accumulations of dust.

The machine is known as the Austin Two-Speed Sprinkler-Sweeper and is manufactured by the Austin Mfg. Co., of Chicago, Ill. The double speed broom is also furnished on the "Standard" Austin sweeper.

Low Charging Concrete Mixer

A mixer designed for the use of contractors in work where a large mixer is not required, especially in street work is shown in the accompanying illustration.

REX LOW CHARGING MIXER.

The mixer, as shown, consists essentially of a mixer drum mounted with a gasoline engine on a low steel truck. The frame is built of steel channels, the wheels being 28 ins. in diameter with 4-in. faces. The machine is 8 ft. ¼ in. in length, over all; 5 ft. 5½ ins. wide, end to end of the axles, and 5 ft. 1 in. in height. The drum is 37 ins. in diameter and 34 ins. long, inside, with a charging opening 21 ins. in diameter, and a discharge opening 16 ins. in diameter. The

AUSTIN TWO-SPEED SPRINKLER-SWEEPER.

power is supplied by a 3-HP. Novo gasoline engine, protected by a steel house.

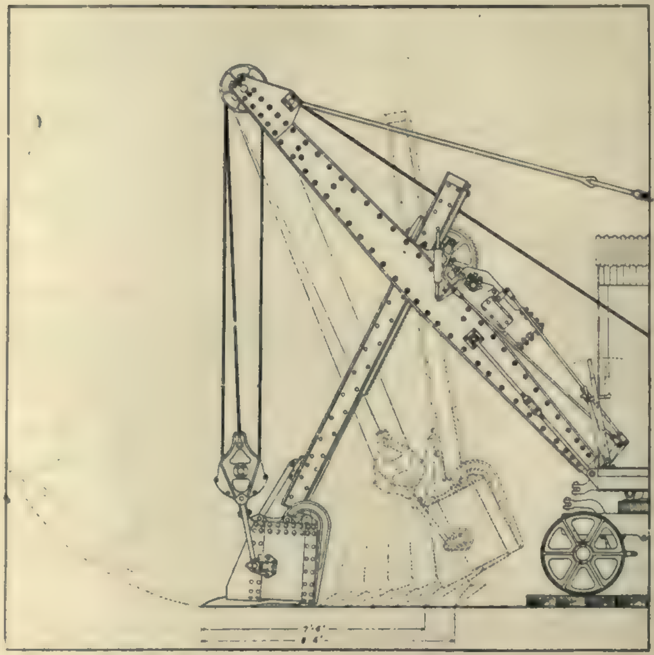
The charging platform used with the mixer stands 18 ins. above the ground, while the lower end of the discharge chute is 20 ins. above ground. The capacity of the mixer is 6 cu. ft. of loose materials, or 5 cu. ft. of mixed concrete per batch, and it is stated that a batch can be mixed and discharged in 45 seconds. The special advantage claimed for the mixer is the low charging feature, which obviates the necessity for the power loader, thus making it possible to put out a machine at a lower cost.

The machine is known as the Rex Low Charging Mixer and is manufactured by the Chain Belt Co., of Milwaukee, Wis.

Revolving Shovel

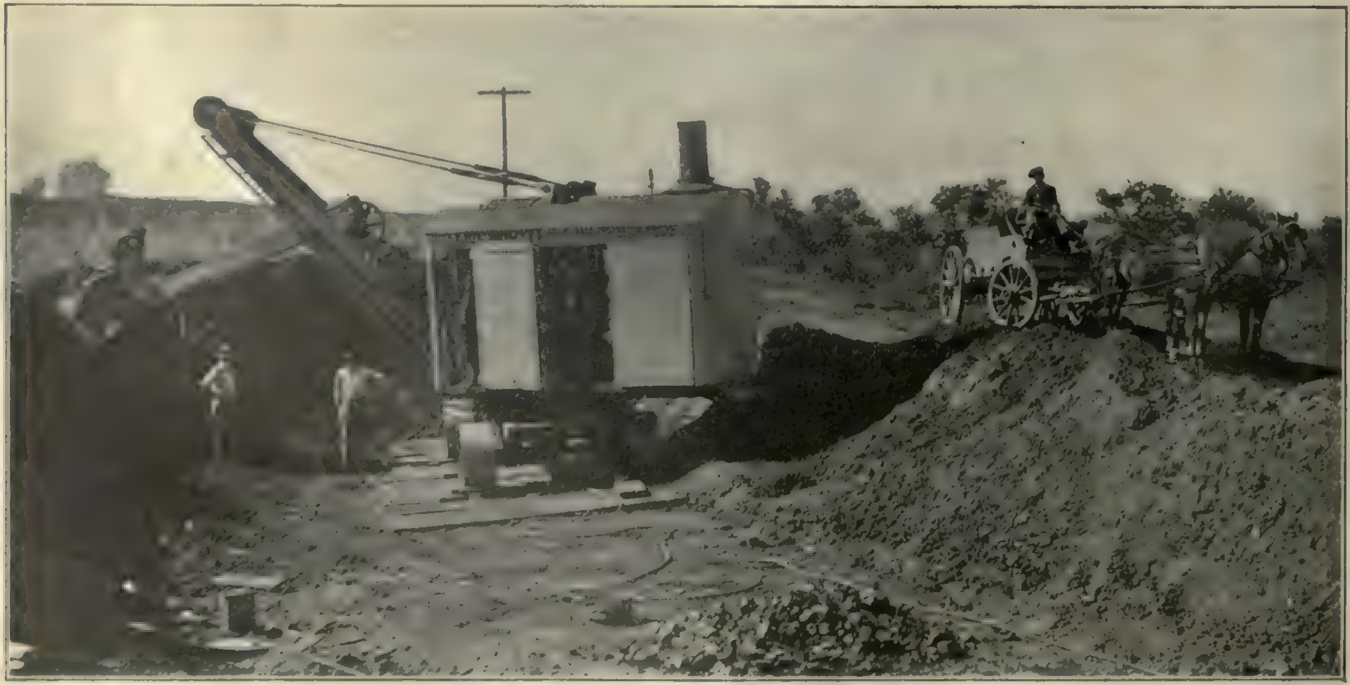
A revolving steam shovel of a new type is shown in the larger of the two accompanying illustrations.

The special features of this shovel are the method of control, and what is designated by the manufacturer as the automatic crowding device, which is shown in detail in the smaller illustration. The automatic crowding device controls the crowding engines in such a way that while the dipper is lifted through the material it is automatically forced into the material at the proper rate, the dipper teeth following a straight line, as shown in the smaller illustration. After being dumped, the dipper automatically returns to the grade on which the shovel is being operated, thus obviating the necessity for manual adjustment. The grade to which the dipper operates can be changed by shifting a special controlling lever. The advantages claimed for this device are that it permits the making of cuts as shallow as 10 ins. in depth at the rate of 25 to 35 cu. yds. per working hour under ordinary conditions, that the desired level is automatically maintained, that it permits of sufficiently fine adjustment for the crowning of roadways, and that it makes it possible for the machine to thoroughly clean up the excavation.

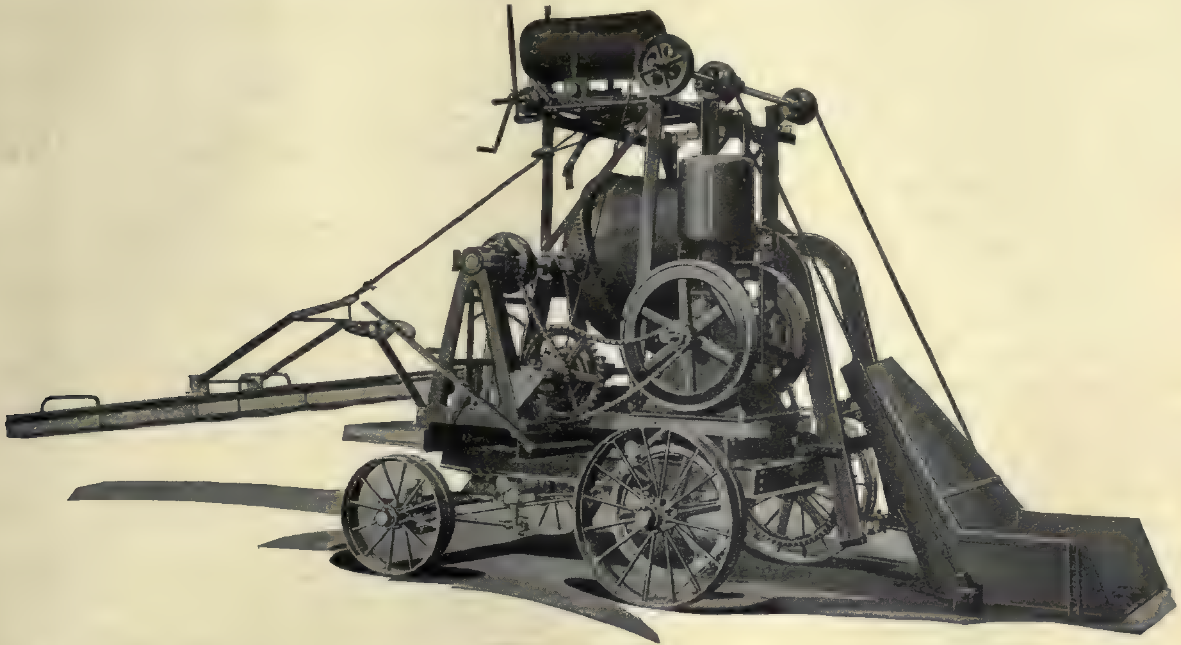

SKETCH SHOWING ERIE CROWDING DEVICE.

All motions of the shovel are controlled by three throttle levers and a foot brake. One lever controls the hoisting clutch and hoisting engines, another the crowding device and the third the swinging motion. The foot brake controls the lowering of the dipper. This method of control, it is claimed, makes the shovel a "one-man" machine, makes possible a large output and makes the machine easy to operate.

The shovel illustrated, which is designated by the manufacturer as Type B, has a shipping weight of approximately 37,000 lbs. and a working weight of about 41,000 lbs. The rated capacity of the dipper in deep cuts in 50 to 60 cu. yds. per hour and in shallow cuts 25 to 35 cu. yds. per hour. Some of the principal dimensions are as follows: Length of boom between centers, 17 ft. 6 ins., height of boom, working position, 17 ft. 11 ins., distance from center of rotation to rear end of cab, 9 ft. 6 ins., distance from center of rotation to point of boom, 17 ft., maximum width, floor level cut, 35 ft., maximum width of cut at the height of 8 ft., 50 ft., height of dump dipper, door open, 13 ft. 2 ins., distance center to center of axles, 7 ft. 8 ins., outside tread of wheels, 8 ft. 4 ins. The hoisting, swinging and crowding engines are of the double reversible type, the swinging and crowd-


ERIE REVOLVING SHOVEL.

ing engines being practically duplicates. The Type B shovel is equipped with a ¾-cu. yd. dipper. The truck frame consists of a single, open hearth steel casting, the bearings for the traction and power steering devices being cast integral with the frame. Both the boom and the dipper handle are built of white oak armored with steel.



WONDER PAVER.

Besides the advantages noted in connection with the automatic crowding device and the method of control, others claimed for the machine are that few moves of the shovel are necessary, as it is possible to excavate over a distance of more than 8 ft. before moving up; that the shovel has a large dumping radius, it being possible to load teams 23 ft. from the center of the shovel, and that teams can be loaded on an 8-ft. bank without taking them into the pit, on account of the dumping height of the machine.

The shovel is known as the Erie Revolving Shovel and is manufactured by the Ball Engine Co., of Erie, Pa.

Street Paver

In the accompanying illustration is shown a street paver recently put on the market.

The machine is 8 ft. wide, 11 ft. high and 8 ft. long without the distributor. It consists essentially of a concrete mixer and gasoline engine, mounted on a 4-wheeled truck and equipped with power loader and distributing chute. The mixer drum is of the tilting batch type, with a capacity of 10 cu. ft. The distributing chute will discharge at a distance of 6, 9 or 12 ft., from the mixer and will swing through an arc of about 1-80 degrees.

The machine is operated by an 8-HP. vertical gasoline engine and is equipped with a traction device. The machine is capable of a speed of 1½ miles per hour forward and 1 mile per hour reverse. The rear wheels are 36 ins. in diameter, and the front wheels 26 ins., and the wheel base is 68 ins. The machine weighs 7,000 lbs.

It is claimed that the machine has a capacity of from 70 to 80 batches of concrete per hour. One of the principal claims made by the manufacturer is that the machine can readily be controlled by one man, all levers being so grouped as to enable the operator to run the machine without leaving his seat.

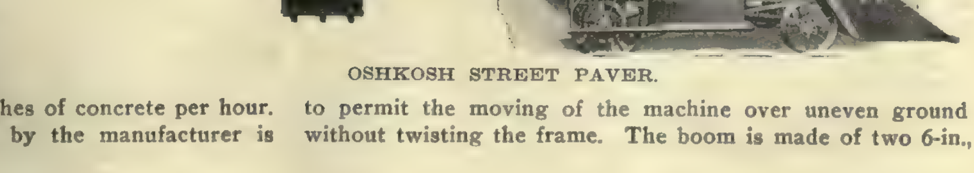
The machine is known as the "Wonder" paver, and is manufactured by the Waterloo Cement Machinery Corporation of Waterloo, Ia.

Street Paving Mixer

A street paving mixer, which is built in two sizes and is equipped with different types of power plants and discharging devices, is shown in the accompanying illustration.

The two sizes in which the machine is furnished, designated as Nos. 14 and 22, have capacities of 14 cu. ft. of loose material or 11 cu. ft. of mixed concrete and 22 ft. of loose material or 17 cu. ft of mixed concrete, respectively. The machine is equipped with steam, gasoline or electric power plants, and with either boom and bucket or distributing chute for discharging. The smaller machine has a wheel base of 92 ins. and the larger of 104 ins. Both are equipped with 30-in. driving wheels, the other pair being 24 ins. in diameter.

The frame of both sizes of machine is built of steel channels, riveted together with angle clips and reinforced with gusset plates riveted at the corners and at the middle of the frame. The frame consists of two longitudinal channels, connected by nine cross channels. The wheels are attached to the frame on the three point suspension idea to permit the moving of the machine over uneven ground without twisting the frame. The boom is made of two 6-in.,



OSHKOSH STREET PAVER.

8-lb. channels, placed 2¼ ins. apart, and is 20 feet long. The boom may be raised or lowered or swung at right angles to the mixer on either side. The bucket is of the center dump type, operated by wire rope, and is handled by the operator of the mixer. After discharging, the bucket is automatically returned to the mixer, the doors closed and the clutch thrown out. The distributing chute, which may be supplied in place of the boom and bucket, is of the telescoping type, 15 ft. long when extended and 8 ft. long when telescoped. The mixing drum on the No. 14 machine has a diameter of 49 ins. and a width of 36 ins., the corresponding dimensions on the No. 22 machine being 58 and 42 ins. The diameter of the openings on the smaller machine is 18 ins. and on the larger 22 ins. An end loader of the open end type is supplied on both machines, that on the No. 14 being 50 ins. wide and 56 ins. deep and that on the No. 22 machine 72 ins. wide and 67 ins. deep. The slope when in elevated position is 46 degrees.

The steam power plant furnished with the No. 14 machine consists of a vertical boiler, 30-ins. in diameter and 78 ins. high, rated at 10 HP. at 100 lbs. The boiler on the No. 22 machine is 30 ins. in diameter, 84 ins. high, rated at 12 HP. at 100 lbs. The steam engine on the smaller machine is of the vertical center crank type, with a 6-in. bore and 7-in. stroke, rated at 8 HP., at 200 r.p.m. The engine on the larger mixer is of the same type, with a 7-in. bore and 7-in. stroke, rated at 10 HP. at 200 r.p.m The gasoline engine supplied on the No. 14 machine is a single cylinder Novo engine, with a 7½-in. bore and 8½-in. stroke, rated at 10 HP. at 450 r.p.m. A Novo two cylinder engine of 6-in. bore and 7½-in. stroke, rated at 12 HP. at 400 r.p.m., is furnished on the No. 22 machine.

The traction mechanism is built in one unit, the transmission being of the selective type with two speeds forward and one reverse, the high speed forward being for use when moving the machine from one job to another. The machine is started and stopped by means of a multiple disc clutch, and on the larger machine there is a differential which can be locked when desired.

The special claims made for this paver are the three point suspension, and the wide wheels, the adequacy of the power plant, and the construction of the transmission and differential.

The machine is known as the Oshkosh Street Paver and is manufactured by the Oshkosh Mfg. Co., of Oshkosh, Wis.

NEWS NOTES

A Bond Issue of $200,000 for Roads has been proposed in Precinct No. 1 of Karnes County, Texas.

An Election on the Issuing of $100,000 of County Road Bonds is to be held in Dade County, Florida, on March 23, according to reports.

New Street Paving in New Orleans, La., in 1915 will cost over $850,000, according to a recent statement by Commissioner of Public Property E. E. Lafaye.

A Bond Issue of $200,000 for Road Construction has been proposed in Mecosta County, Michigan. It is reported that the matter will be decided at the spring election.

Plans for Systematic Road Dragging in Douglas County, Kansas, are being made by interested citizens. According to reports, it has been suggested that the county officials appoint a man in each community to designate the times at which the roads shall be dragged.

A Group of Members of the 365 Day Good Roads League of Chesterfield County, South Carolina, is the subject of a photograph reproduced on a poster recently received from LaCoste Evans, "Good Roads 'Pusher,'" of Cheraw, S. C. The reverse side of the poster is an appeal to the women of Chesterfield County to use their influence for good roads,

PERSONAL NOTES

C. F. Wallow has been appointed City Engineer of York, Pa.

J. W. Barnett has been appointed City Engineer of Athens, Ga.

J. R. Penland has been appointed City Engineer of Albany, Ore.

Samuel Dyer has been appointed City Engineer of Attleboro, Mass.

Stanley Macomber has resigned as City Engineer of Centralia, Wash.

F. R. Charnock has been reappointed City Engineer of Medford, Mass.

Bertram Brewer has been appointed City Engineer of Waltham, Mass.

B. L. Dorman has been reappointed City Engineer of Vancouver, Wash.

T. B. Chambers has been reappointed Street Commissioner of Hood River, Ore.

F. W. Proctor has been appointed City Engineer of North Adams, Mass.

Gottlieb Kugler has been appointed Superintendent of Streets of Carlstadt, N. J.

John B. Wickware has been appointed Superintendent of Public Works of Rutherford, N. J.

A. B. Hayes has been reappointed engineer in charge of highway work at Fort Worth, Tex.

H. S. Morse has been elected Director of the Cincinnati (Ohio) Bureau of Municipal Research.

George C. Brehm has been appointed Borough Engineer and Street Commissioner of Waynesboro, Pa.

R. W. Moore has been elected Road Superintendent of Augusta County, Virginia, to succeed W. V. Smiley.

Malcolm F. MacFarland has been appointed County Engineer of Lee County, Iowa, succeeding M. E. Bannon.

Irving L. Ryder, formerly City Engineer of San Jose, has been appointed County Surveyor of Santa Clara County, Cal.

Jesse G. Vincent has been appointed Vice President of the Packard Motor Car Co. to succeed Sidney D. Waldon, who has resigned.

John Burke, Treasurer of the United States, has succeeded the late Lee McClung as Treasurer of the American Highway Association.

H. Elting Breed, of Cornwall, N. Y., has been appointed First Deputy Commissioner of the New York State Highway Department to succeed George A. Ricker.

Fred W. Sarr, of Fulton, N. Y., has been appointed Second Deputy Commissioner of the New York State Highway Department to succeed Paul Schultze.

H. J. Goodale, for a number of years Assistant Superintendent of Public Works of Pittsfield, Mass., has been appointed Superintendent of Public Works of Attleboro, Mass.

Benjamin J. Rice, of Friendship, N. Y., has been appointed Third Deputy Commissioner of the New York State Highway Department to succeed Walter Willson.

Walter G. Kirkpatrick, M.Am.Soc.C.E., recently City Engineer of Birmingham, Ala., and Special Engineer in the Executive Department of the Alabama Power Co., has opened an office in the Farley Bldg., Birmingham, Ala., and has resumed his former practice as consulting engineer on paving, garbage disposal and other branches of municipal engineering.

B. F. Affleck has recently been elected president of the Universal Portland Cement Co., a subsidiary of the United States Steel Corporation, to succeed Edward M. Hagar, whose resignation is noted elsewhere on this page. Mr. Affleck entered the service of the Illinois Steel Co. in 1896, and from 1901 to 1903 represented the cement department of that company in the St. Louis territory. Upon the incorporation of the Universal Portland Cement Co. in 1906, to take over the cement business of the Illinois Steel Co., Mr. Affleck became the general sales agent—an office which he has held since that time. Mr. Affleck is also vice president of the Cement Products Exhibition Co.

Edward M. Hagar, who was for 15 years at the head of the Universal Portland Cement Co., recently resigned as president of that company. Mr. Hagar served as president of the Association of American Portland Cement Manufacturers for two years and was the founder of the Cement Products Exhibition Co., which conducts the annual cement shows. Mr. Hagar graduated from the Massachusetts Institute of Technology in 1893, and received a post graduate degree from Cornell in 1894. Before he was connected with the cement industry he was the head of Edward M. Hagar Co., of Chicago, Ill. Mr. Hagar retires to assume the presidency of a new company which he is forming, with headquarters in Chicago, to acquire a chain of Portland cement factories.

NEWS OF THE TRADE

The Ardmore Rock Asphalt Co. has recently been incorporated under the laws of Kansas, the incorporators being George T. Stabler, M. V. Kistler and W. W. Mills, of Topeka, Kan.; C. D. Ledbetter, W. S. Wolverton and James Downard, of Ardmore, Okla., and Truman Wilhelm, of Coalgate, Okla. The company is capitalized at $10,000.

The Rumely Products Co., of Chicago, Ill., has recently issued three catalogues descriptive, respectively, of the "Advance," the "Gaar-Scott" and the "Rumely" lines of power farming machinery, included in which are various types of traction engines. The catalogues are uniform in size and general character and are exceptionally well executed.

A new company known as the Pioneer Asphalt Co. has been formed to take over the plant and other assets of the American Asphaltum & Rubber Co. The company will produce a full line of asphalts similar to those manufactured by the former company and, in addition, a number of new specialties. These will be marketed under the name of "Pioneer Brand." H. B. Pullar, formerly Assistant Manager and Chief Chemist of the American Asphaltum & Rubber Co., and later the senior partner of the H. B. Pullar Co., of Detroit, Mich., is the General Manager. The plant and offices of the company will be at Lawrenceville, Ill.

The Troy Wagon Works Co., of Troy, Ohio, has recently commenced the construction of a new motor truck trailer works. The new building is to be 120 by 140 ft. in size and will make it possible for the company to turn out over 60 trailers a week. The company is now manufacturing these trailers in three sizes—1½ tons, 2½ tons and 5 tons—and has found the additional plant necessary to handle its growing business in this part of its line.

"The Baker Armored Concrete Pavement Has Made Good" is the title of an 8-page folder recently issued by the R. D. Baker Co., of Detroit, Mich. The folder is devoted to illustrations and descriptions of the Baker Improved armor plate, the Baker Indestructible forms for concrete pavements and concrete curbs and the Baker Automatic finishing machine. The methods of installing the armor plate and of using the forms are also described.

The Good Roads Machinery Co., Inc., of Kennett Square, Pa., has recently issued a booklet devoted to the line of road machinery manufactured by the company. The machinery and appliances described and illustrated comprise road machines, road drags, rock crushing outfits, road rollers, traction engines, distributors, heating kettles, pouring pots, sweepers, flushers, dump cars, scrapers, plows, metal culvert pipe and steel highway bridges. The catalogue is 10¾ by 7¾ ins. in size and contains 24 pages.

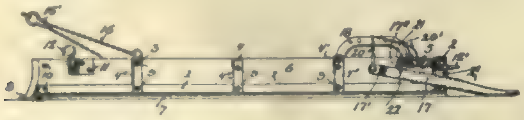
"Troy Truck Trailers, Book One" is the title of a booklet being distributed by the Trailer Department of the Troy Wagon Works Co., of Troy, Ohio. The booklet is devoted to the description and illustration of the Troy trailer and includes a discussion of hauling methods and a discussion of hauling costs. There are several illustrations showing the application of the trailer principle in haulage of various kinds and several others showing the trailer and its use. The booklet is 5 by 7 ins. in size and consists of 16 pages and covers. It is well printed in two colors and is well illustrated.

The Austin-Western Road Machinery Co., of Chicago, Ill., is distributing a convenient memorandum book of about 50 pages, which is also an index to the several catalogues of road machinery published by the company. On each right-hand page of the memorandum book is space for memoranda and on each left-hand page is an illustrated description of some machine or appliances included in the company's line of machinery. The book is 3 by 5 ins. in size and is held together by brass rings instead of being bound in the usual way. The front cover is of celluloid, on which is lithographed in 12 colors a picture entitled "An Idyll of the Sea." The back cover, also of celluloid, carries a calendar for 1915 and 1916. Copies may be secured on application.

"Atlantic Asphalt in Modern Road Building" is the title of a booklet being distributed by the Atlantic Refining Co., of Philadelphia, Pa. The booklet contains full page illustrations of the plant of the company at Point Breeze, Philadelphia; The Northeast Boulevard, Philadelphia; McCallum Street, Philadelphia, and a road on the T. W. Roberts Estate, Cynwyd, Pa. and two smaller illustrations one of 13th Street, Philadelphia, and the other of the Northeast Boulevard, the latter showing the street under construction. The text is devoted to a discussion of the use of the company's product in road construction and treatment. The booklet is 4¾ by 8¾ ins. in size, contains 12 pages, and is a light buff tint, printed with brown ink. The illustrations are excellent halftones, and the booklet is very attractively gotten up.

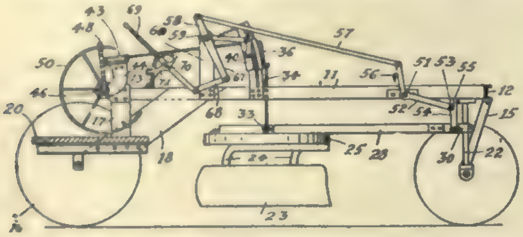
RECENT PATENTS

The following list contains the numbers of the principal patents relating to roads and pavements and to machinery used in their construction or maintenance which have recently been issued, together with the names and addresses of the patentees, dates of filing, serial numbers, etc. In some cases the principal drawing has also been reproduced. Printed copies of patents listed may be obtained for 5 cts. each by application to the Commissioner of Patents, Patent Office, Washington, D. C.

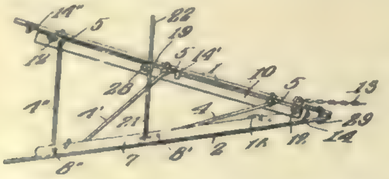


1,126,001. ROAD WORKING MACHINE. Christopher S. Gald, Soldiers Grove, Wis. Filed Nov. 1, 1913. Serial No. 798,651. (Cl. 37-5.)

1,126,077. ROTARY DRIER. William E. Prindle, Manitowoc, Wis. Filed Aug. 6, 1913. Serial No. 783,248. (Cl. 34-6.)



1,126,117. GRADING MACHINE. Charles K. Stockland, Minneapolis, Minn. Filed May 2, 1914. Serial No. 835,797. (Cl. 37-7.)

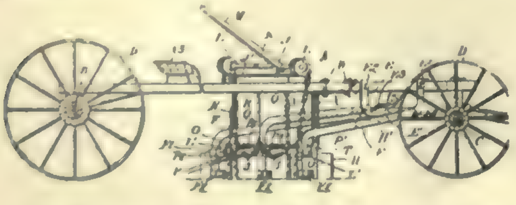


1,126,805. COMBINATION DRAG, GRADER AND DITCHER. Martin H. McCaulou, Butlerville, Ind. Filed July 12, 1913. Serial No. 778,814. (Cl. 37-5.)

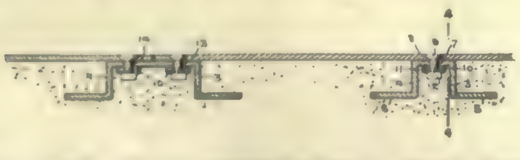
1,127,059. DUMPING WAGON. Harry S. Marshall, Mechanicsburg, Pa. Filed July 6, 1914. Serial No. 849,213. (Cl. 21-86.)

1,127,063. DUMP WAGON. Samuel Miller, Chicago, Ill. Filed Mar. 2, 1914. Serial No. 821,865. (Cl. 21-24.)

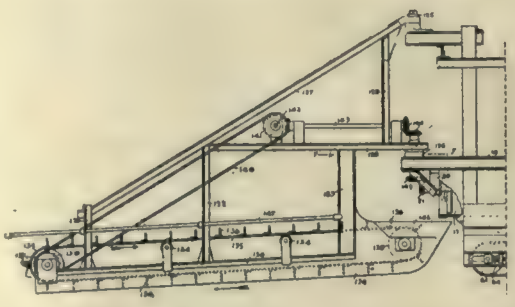
1,127,101. CRUSHER. Albert E. Smith and Charles G. Simonds, Milwaukee, Wis. Filed Mar. 30, 1911. Serial No. 617,888. (Cl. 83-10.)



1,127,380. ROAD DRAG. James Bolton, Brush, Colo. Filed June 27, 1914. Serial No. 847,746. (Cl. 37-7.)

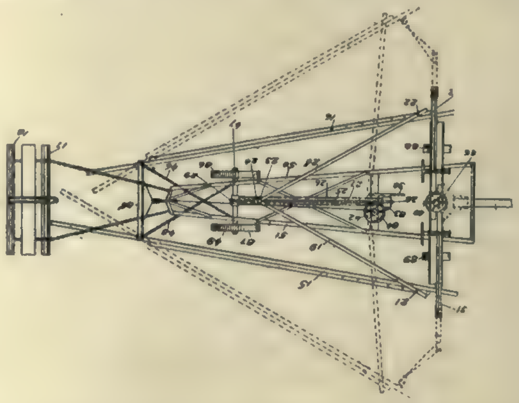


1,127,518. HARD ROAD CONSTRUCTION. Edwin Robertson, Fairmount, Ill. Filed Oct. 3, 1914. Serial No. 864,747. (Cl. 104-178.)

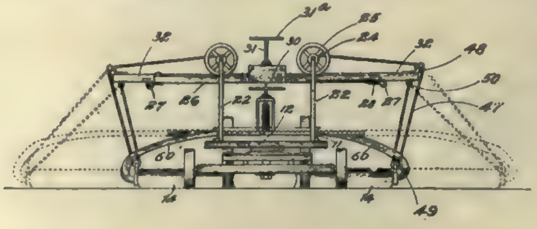


1,128,174. ROAD BUILDING MACHINE. Joseph Henry Moore, Jr., New York, N. Y., assignor to Pioneer Iron Works, New York, N. Y. Filed Dec. 26, 1913. Serial No. 808,779. (Cl. 94-6.)

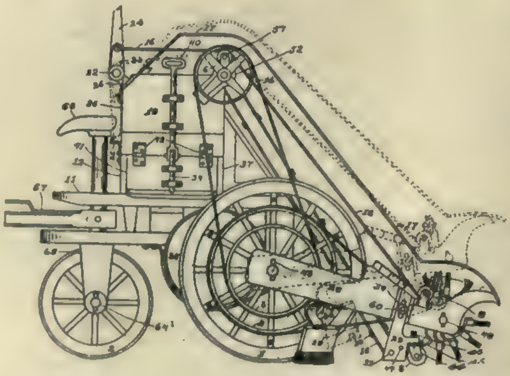
1,128,478. BASCULE BRIDGE. Columbus McKibben, Aransas Pass, Tex. Filed Jan. 6, 1914. Serial No. 810,678. (Cl. 14-40.)



1,128,654. ROAD GRADING MACHINE. James M. Bresee, Mattoon, Ill. Filed May 1, 1913. Serial No. 764,777. (Cl. 37-7.)



1,128,655. ROAD MACHINE. James M. Bresee, Mattoon, Ill. Filed Oct. 28, 1913. Serial No. 796,900. (Cl. 37-7.)



1,128,883. SWEEPING MACHINE. John M. Layton and Henry G. Haworth, Leavenworth, Kan. Filed Aug. 15, 1913. Serial No. 784,944. (Cl. 15-17.)

1,128,916. COMBINED PLOW AND DRAG. Henry W. Thayer, Syracuse, N. Y. Filed Oct. 21, 1913. Serial No. 796,502. (Cl. 55-85.)

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Copy for advertisements of which proofs are to be submitted to advertisers should reach the New York office as follows: For insertion in the first issue of the month, by the fifteenth of the preceding month; for other issues, by noon on Thursday of the week before date of issue.

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The Status of the Alabama State Highway Commission

That the State Highway Commission of Alabama is a permanent body and that state aid road work can proceed along the lines followed heretofore are the main points of a recent opinion by Attorney General Robert C. Brickell of that state.

It has been held in some quarters, according to reports, that the State Highway Commission would be automatically abolished upon the expiration of the terms of the present commissioners. This matter was laid before Attorney General Brickell, who examined the law creating the Highway Commission, which was passed in 1911, and advised the commission of his findings. According to Attorney General Brickell's letter to the commission, an examination of the act creating the Highway Commission "seems to demonstrate that it was intended by the Legislature that it should to be a permanent body and that the state aid road building prescribed by the act should be continuous." He pointed out that the appropriation made by Section 5 of the act is made an annual appropriation and that there is nothing in the act to limit the appropriation to four years.

Regarding the appointment of commissioners upon the expiration of the terms of the recent incumbents, Attorney General Brickell is quoted as follows:

"While there is no express provision for the manner of reappointment, or for the reappointment of members of the commission after the expiration of their terms, construing the act as a whole it would seem clear that it was the legislative intention that at the expiration of the terms of the commissioners their successors should be reappointed in the same manner as the original members were appointed."

Town Highway Appropriations in Maine

Appropriations for highway work have been voted at recent town meetings in Maine as follows:

Albany, $1,500; Bethel, $4,666; Bowdoin, $1,200; Bridgton, $500; Brownfield, $4,533; Buckfield, $5,075; Carthage, $1,100; Farmington, $7,000; Freeman, $400; Fryeburg, $3,600; Gorham, $6,000; Greenwood, $3,710; Hartford, $1,500; Kennebunkport, $10,000; Lisbon, $4,500; Litchfield, $2,033; Newry, $1,500; New Sharon, $2,200; Norway, $4,000; Palmyra, $2,000; Pittston, $2,000; Readfield, $2,533; Rumford, $10,000; Sorrento, $1,100; South Paris, $4,000; Sumner, $3,100; Temple, $1,000; Weld, $1,600; West Gardiner, $1,000; Windham, $3,500.

The appropriations noted in the foregoing paragraph are partly for roads and partly for bridges.

Further Highway Appropriations by Massachusetts Towns

In addition to the appropriations for road work by Massachusetts towns which were noted in the issues of February 13 and 20, the following sums have been appropriated for highway and bridge construction, maintenance and repair:

Acushnet, $5,000; Agawam, $5,000; Ashburnham, $3,000; Berlin, $1,400; Boylston, $2,500; Chester, $3,000; Chesterfield, $1,700; Cummington, $1,800; Egremont, $1,500; Erving, $3,580; Fall River, $6,000; Florida, $2,500; Gardner, $40,500; Goshen, $900; Hadley, $3,000; Hancock, $1,300; Hanson, $1,000; Heath, $1,500; Ipswich, $12,400; Leominster, $34,000; Leverett, $1,600; Leyden, $3,200; Marion, $5,500; Merrimac, $1,500; Middlefield, $1,000; Newburyport, $18,625; North Reading, $3,650; Otis, $1,700; Phillipston, $1,200; Plainfield, $1,100; Rowe, $1,550; Sandwich, $4,500; Tolland, $1,250; Warwick, $2,200; Wendell, $2,000; Westhampton, $1,300; Westminster, $3,850; Williamsett, $23,000.

New York State Road Bonds Sold

On Wednesday of this week New York state bonds to the amount of $27,000,000, of which a portion were highway bonds, were sold.

The bonds bear interest at 4¼ per cent., $5,000,000 worth being 30-year bonds and the remainder 50-year bonds. The highway bonds run for 50 years. The bonds were awarded to Harris, Forbes & Co., the Guaranty Trust Co., the National City Bank of New York, Brown Bros. & Co., and White, Weld & Co, at their joint bid of 103.459. This will bring the premium to the state to $933,930.

In all, 139 bids were received, the highest bid for a small portion of the bonds being 106, which was offered for $30,000 worth by the First National Bank of Salamanca. State Comptroller Travis is said to have expressed himself as well pleased at the showing of confidence in the financial condition evidenced by the premium obtained. State bonds last year were sold at 4½ per cent. interest, and the reduction in interest this year will result in a saving to the state of about $67,000 annually in interest charges, which during the life of the bonds will amount to something over $3,000,000.

Proposed Paving in Davenport, Iowa

According to present plans, 20 streets and 10 alleys are to be paved this year in Davenport, Ia., at a total cost of about $24,500. The plans call for the improvement of portions of the following streets with the materials indicated:

Brick—East, Christie, Ainsworth, Harrison, 9th and 13th Streets, and Ridgewood, Mississippi and Oxford Avenues; asphalt—Henry, Bowditch, Washington, Pleasant and Myrtle Streets, and Fair, South and Central Park Avenues; asphaltic concrete—Hayes Street; asphaltic macadam—Forest Road and Mueller Avenue.

Road School at the University of Tennessee

A road school was held at the University of Tennessee February 23 to 26.

The work of this school comprised lectures followed by discussions. Among those scheduled to speak were various members of the faculty of the University; W. S. Keller, State Highway Engineer of Alabama; Clifford Older, Bridge Engineer, Illinois State Highway Department: Dr. L. I. Hewes, Senior Highway Engineer, U. S. Office of Public Roads, and W. E. Myer, President of the Tennessee Highway Association.

George A. Ricker Appointed Consulting Engineer of the New York State Highway Department

George A. Ricker, M.Am.Soc.C.E., has been appointed Consulting Engineer to the New York State Commission of Highways.

As noted in "Good Roads" for March 6, Mr. Ricker was succeeded as First Deputy Commissioner of Highways by H. E. Breed. Commissioner Duffey, being desirous of retaining Mr. Ricker's services, applied to the State Civil Service Commission for permission to appoint him Consulting Engineer, and the permission was given. During 1913 the commission had an advisory board, consisting of Harold Parker, George C. Diehl and the late William DeH. Washington. Gen. William T. Rossell, who acted as Consulting Engineer last year, retired in August.

NEWS NOTES

Logan County, Iowa, is to Expend about $50,000 for the construction of concrete roads this year, according to reports.

Proposed Street Work in Sioux Falls, S. D., includes the construction of 74,706 sq. yds. of pavement. During 1914 the total amount of paving laid in the city was 129,617 sq. yds.

The Improvement of 144 Streets and Alleys is to be undertaken this season in the city of Columbus, Ohio, according to a recent report.

The Daytona District of Volusia County, Florida, will vote, early in April, on a $350,000 bond issue for the construction of roads. The fact that such a measure was under consideration was noted in "Good Roads" for Feb. 6.

The Bonding of Grayson County, Texas, for $900,000, was advocated at a recent meeting held at the Chamber of Commerce of Sherman. It is proposed to use the proceeds of the bond issue for the construction of a 100-mile system of roads. The meeting was attended by representatives from many of the towns of the county.

The Granite Block Pavement in Astor Place, New York, N. Y., is being cited by advocates of that type of pavement as an example of the excellence of granite blocks laid under the improved specifications now in force in the City of New York. The pavement was completed in 1911, and it is stated that it is now in as good condition as upon its completion and that, in spite of the very heavy traffic which it has to bear, shows no perceptible sign of wear. It is also stated that there has been no expenditure for maintenance on this particular pavement, and that as no street openings have been made since the pavement was laid, an ideal opportunity is given to note its wearing qualities and its behavior under traffic.

An Election on the Proposition of Issuing $200,000 in Bonds for road construction will be held in Mason County, Kentucky, on April 10.

An Issue of $36,000 in Bonds has been made in the city of Fullerton, Cal. The funds obtained from the sale of the bonds will be used for the construction of about two miles of paving.

A Bond Election will be held in Lamar County, Alabama, on March 23, to decide whether or not road bonds to the amount of $150,000 shall be issued. In December of last year $75,000 in bonds was voted for roads.

According to the Annual Report of City Engineer Roche, of Troy, N. Y., street work in that city during 1914 included the construction of 7¼ miles of new pavement on 15 streets at a cost of $277,520. The report also estimates the annual expense of cleaning each mile of paved streets at $3,000.

The Officials of Knox County, Tennessee, have requested an enabling act permitting the county to issue $500,000 in bonds to provide funds for the construction and reconstruction of county roads. It is proposed to have the work carried on under the present road commission, acting with an advisory commission to be appointed later.

The Appropriation for 1915 Street Work in Milwaukee, Wis., is $250,000, as against $300,000 for the same purpose in the budget for 1914. The total expenditure for street construction last year was $1,400,000, all of which, except the $300,000 previously mentioned, was paid by the property owners. In addition to this work, $275,000 was expended for other street improvement. According to a recent calculation by Superintendent of Street Construction F. J. Blodgett, the city of Milwaukee now has 600 miles of streets, of which 390 miles are improved. Recommendations for the paving of 4 miles of street have already been made by the Public Works Department to the Common Council, and it is planned to have the work started as soon as the frost is out of the ground, in order to give work to the unemployed. According to an estimate by Superintendent Blodgett, the street work will give employment to about 900 men. Laborers will probably receive $2 per day and skilled workmen various amounts up to $4 per day.

NEWS OF THE TRADE

The American Mfg. Co., of Chattanooga, Tenn., has recently established a shovel factory at that city and will manufacture a line of shovels, spades and scoops. The officers of the company are J. B. Robinson, President; D. N. Hey, Vice President, and W. N. Kyle, Secretary.

The Universal Portland Cement Co., of Chicago, Ill., has recently announced the appointment of Chas. S. Fletcher as Manager of the Sack Bureau, the appointment of Oscar N. Lindahl as Chief Accountant, and the resignation of Gordon Wilson as Assistant Secretary.

J. L. Keir, of Philadelphia, Pa., has been selected as the Philadelphia representative of the Troy Wagon Works Co., of Troy, Ohio. Mr. Keir, who is a manufacturers' agent, with offices in the Abbott Bldg., Broad and Race Sts., will handle Troy motor truck trailers, reversible traction wagons and dump wagons.

COMING MEETINGS

March 22-26.—Dominion Good Roads Association and Ontario Good Roads Association.—Second Canadian and International Good Roads Convention, Convocation Hall, Toronto, Ontario, Canada. Secretary-Treasurer, George A. McNamee, 909 New Birks Bldg., Montreal, P. Q., Canada.

March 24-25.—Florida State Good Roads Association.—Annual Convention, St. Petersburg, Fla. Secretary, J. P. Clarkson, Jacksonville, Fla.

GOOD ROADS

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Clinton Cowen Appointed State Highway Commissioner of Ohio

Clinton Cowen, County Surveyor of Hamilton County, Ohio, has been appointed State Highway Commissioner by Governor Willis of Ohio, to succeed James R. Marker, resigned.

Mr. Cowen received his training in the Engineering Department of the University of Michigan, at the Ohio State University and at Harvard University. He is at present serving his sixth term as County Surveyor of Hamilton County, his term of office expiring next September.

Seventh Annual Convention of the Michigan Good Roads Association

The seventh annual convention of the Michigan Good Roads Association was held at the Coliseum, Grand Rapids, Mich., March 9 to 12.

Sessions were held on each of the four days and, in addition, there were evening meetings and a banquet to the officers and speakers on Thursday evening. Among the speakers were Governor Ferris of Michigan, State Highway Commissioner Frank F. Rogers of Michigan, and P. T. Colgrove, President of the Michigan Good Roads Association. An exhibition of road machinery and materials was held in connection with the convention.

Officers of the Michigan Good Roads Association were elected as follows: President, Philip T. Colgrove, of Hastings; Vice President, N. P. Hull, of Dimondale; Secretary, A. A. Anderson, of Hastings, and Treasurer, J. Edward Roe, of Lansing. The following were appointed by President Colgrove as the Board of Trustees: Roy D. Chapin, of Detroit; Alvah W. Brown, of Grand Rapids; W. K. Prudden, of Lansing; John N. Lentz, of Monroe; Dr. George F. Young, of South Haven; A. H. Dudley, of Jonesville; Frank Hamilton, of Traverse City; W. M. Bryant, of Kalamazoo; Charles Farrin, of Mt. Clemens, and C. E. Parmerlee, of Lapeer.

Contract for Interstate Bridge between Portland, Oregon, and Vancouver, Washington

Contracts have recently been awarded for most of the work of building the interstate bridge between Portland, Ore., and Vancouver, Wash. According to a recent statement, work will be commenced about the middle of April and the bridge will be completed by November, 1916.

The total length of the bridge is 17,000 ft., of which 5,000 ft. will be of steel spans. The roadway over the bridge will be 38 ft. wide between curbs and will be paved with asphalt. There will be a lift span 250 ft. in length.

The estimated total cost of the bridge is $1,560,000. Contracts so far awarded amount to $1,305,063.52, and cover all of the work except that of paving the approaches.

Paving Contracts Awarded in Topeka, Kansas

Three contracts for street work amounting to a total of $142,021.73 were awarded in the city of Topeka on Friday of last week. The work includes 36½ blocks of street paving and 2½ blocks of alley paving.

The contract for brick paving was awarded to Olson & Schmidt, of St. Joseph, Mo., at $78,467.73. The contract for all of the asphalt paving, except four blocks on 11th St., was awarded to J. R. Ramsey, of Lawrence, Kan., at $57,600; and the contract for the asphalt paving on 11th St. was awarded to the Kaw Paving Co., of Topeka, Kan., at $5,954. The Ramsey contract includes, besides the construction of 12 blocks of asphalt pavement, a large amount of storm sewer construction.

Asphalt pavements are to be laid on portions of Hancock, Fillmore, 7th, Broadmoor and 11th Sts., and College, Willow and Jewell Aves. Brick pavements are to be laid on portions of 6th, 7th and Van Buren Sts., and Ashland and Seward Aves.

Street Work in Fort Worth, Texas

Street improvement work, the cost of which will amount to about $225,000 has been started in the city of Fort Worth, Tex. Of the total amount, over $200,000 will be spent in paving streets and making connections with the county road system. The remainder will be used for grading and graveling residence streets.

Among the streets on which paving will be done are the following: Clinton Ave., $44,695; Ellis Ave., $35,402.23; North Houston St., $27,881.20; West 10th St., $4,232.53; Taylor St., $30,323.47; Galveston Ave., $6,263, and 5th Ave., $7,455.

The work to connect with the county road system includes the improvement of about 5 miles of street, at an average cost of $10,000 per mile. In this work the city will take care of the grading, the preparation of the foundation and the drainage work, the cost of the surfacing being assessed against the property owners.

Grading and graveling work will be undertaken shortly on 16 streets. The city and the property owners will meet the cost of this work, which, it is estimated, will amount to about $25,000. Portions of the following streets are to be graded and graveled: St. Louis, Cantey, Lowden, Bowie, Gould, Richmond, Duxton, Josephine, East Leuda, 21st, College, Milano, Cromwell and Market Sts.

Preliminary Arrangements for the Pan American Road Congress

At a meeting of the Joint Committee of the American Road Builders' Association and the American Highway Association, held at Montpelier, Vt., on Thursday of this week, the committee's organization was perfected by the election of Governor Gates as the fifth member and Chairman of the committee. Arrangements were made for the holding of a joint convention of the two associations this fall.

The convention will be held in connection with the Panama-Pacific Exposition and will be called the Pan American Road Congress. The time has been tentatively fixed as the week of September 6, this depending upon the making of satisfactory local arrangements.

The committee, which has been at work since the latter part of last year, consists of Major W. W. Crosby and E. L. Powers, who were appointed by the American Road Builders' Association, James H. MacDonald and J. E. Pennybacker, appointed by the American Highway Association, and Governor Gates of Vermont, formerly State Highway Commissioner of that state, who is identified with neither association and was chosen as the fifth member by the other four members of the committee. It was also voted to employ a secretary and a field secretary. To facilitate the work of the committee, which will have entire charge of the arrangements for the meeting in California next fall, its work for the present was apportioned among four sub-committees, as follows: Finance, Mr. MacDonald; Program, Major Crosby; Publicity, Mr. Powers, and Arrangements, Mr. Pennybacker. These sub-committees will start upon their work at once.

NEWS NOTES

A Bond Issue of $300,000 for the construction of gravel roads is proposed in Fulton County, Kentucky.

A Bond Issue of $300,000 has recently been voted in Ballard County, Kentucky. According to reports, the Ballard County Good Roads Association was largely instrumental in securing a favorable vote on the issue.

Preliminary Steps for the Paving of 24 of the Principal Streets of San Jose, Cal., have recently been taken by the City Council of that place. It is stated that when this work is completed at least half of the streets in the city will be paved.

A Contract for Brick Paving, Amounting to $132,364.72, has been awarded by the authorities of Deal, Monmouth County, New Jersey. The contract, which is for paving Ocean Ave., was awarded to the Scheffler-Burns Paving Co.

The Paving of Several Streets in St. Paul, Minn., at a total cost of nearly $40,000 has recently been authorized by the City Council. The pavements will be laid on portions of Wabasha, Winifred, Ohio and George streets, the materials to be used being creosote wood blocks where the grades will permit and sandstone blocks on the steeper portions.

The $250,000 Road Bond Issue in Bell County, Kentucky, which was noted in "Good Roads" for Feb. 27, has been declared valid by a recent decision of the Court of Appeals. The validity of the election, which was held on Feb. 13, was attacked on the ground that the bonds were voted on a day other than the regular election day, that the election was called on the same day the petition was filed and that the electors were not given an opportunity to pass upon the rate of interest or the life of the bonds.

Street Signs Imbedded in the Sidewalks at street corners are to be provided in the city of Petaluma, Cal. The decision to undertake this work was made at a recent meeting of the City Council.

A System of Paved Highways in Imperial County, California, is the object of a campaign which has recently been inaugurated. To further the ends desired, a subcommittee of the Valley Chamber of Commerce has been appointed to prepare a report recommending the routes, etc. The committee consists of W. S. Fawcett, of Heber; W. H. Best, of Brawley; Frank Reading and Ray S. Carberry, of El Centro, and Fred E. Place, Secretary of the Valley Chamber of Commerce.

The Senate of the Iowa Assembly has recently passed two bills relating to highway work. The first, S. F. 199, provides for the cutting of weeds along the highways by the owners of abutting property, and the second, S. F. 330, gives the State Highway Commission power to do away with dangerous grade crossings. A bill known as S. F. 26, providing that all vehicles operating on the highways at night shall display a light, has been killed, although a motion to reconsider has been filed.

The $100,000 Bond Issue Recently Voted in Corpus Christi, Tex., and noted in "Good Roads" for March 6, will, according to present plans, be used for paving on portions of Staples, Tiger, Chaparral, Palo Alto, Water, Aubry, Media, Winnebago, Carrizo and Leopard Sts., Buford and Furman Aves. and North Broadway. The money obtained from the sale of the bonds will be used to meet the city's portion of the cost of the work, which abounts to 25 per cent, the abutting property owners paying the balance.

An Investigation of the Luten Concrete Bridge Patents by the United States Senate was authorized in a resolution passed by that body shortly before the adjournment of Congress. The resolution, which was introduced by Senator Bristow of Kansas, authorizes and directs the Committee on Patents or a subcommittee thereof to investigate and report relative to the issuing of patents to Daniel B. Luten from 1900 to the present time, with particular reference to the methods by which they were obtained and the legality of their issuance. It is directed that the result of the investigation be reported to the Senate at as early a date as practicable.

The Iowa Bridge Builders' Association has recently adopted resolutions defining the position of its members in regard to the present highway law of the state. The resolution, which was adopted at a meeting in Des Moines on Friday of last week, states that it has come to the attention of the association that the highway bridge builders of the state are accused of aligning themselves against the present road law and are using undue influence to effect adverse legislation. This is denied, but it is stated that the association favors certain modifications of the present law and requests an early hearing before the State Highway Commission and the Joint Legislative Committee on Roads for the purpose of discussing modifications of the present law.

COMING MEETINGS

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March 24-25.—Florida State Good Roads Association.—Annual Convention, St. Petersburg, Fla. Secretary, J. P. Clarkson, Jacksonville, Fla.

The date of the Ninth Annual Cement Show, at Chicago, Ill., has been changed in order to permit the utilization of addtional space. It will open at 2 p. m. on Saturday, February 12, 1916, and close at 11 p. m., Saturday, February 19, 1916. This change was necessitated by the renting of the First Infantry Armory to accommodate the exhibits for which there was no room in the Coliseum and the Annex. According to an announcement by the Cement Products Exhibition Co., the securing of the armory makes available 68 spaces in addition to those previously available in the Coliseum and the Annex.

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Short Course in Highway Engineering for County Superintendents of Highways of Illinois

A short course in highway engineering for the benefit of county superintendents of highways of Illinois will be held at the Leland Hotel, Springfield, Ill., March 30 to April 2.

The sessions on Tuesday, March 30, have been set aside for the exclusive use of the county superintendents, and a smoker will be held that evening. On Wednesday and Thursday, forenoon, afternoon and evening sessions will be held, and on Friday there will be two sessions. The speakers on the tentative program are President A. D. Gash of the Illinois State Highway Commission; Chief State Highway Engineer W. W. Marr; George A. Quinlan, County Superintendent of Cook County; H. B. Bushnell, Division Engineer, of the State Highway Department; Clifford Older, Bridge Engineer of the State Highway Department; G. F. Burch, Assistant Engineer of the State Highway Department; Ira O. Baker, Professor of Civil Engineering, University of Illinois; P. C. McArdle, Assistant State Highway Engineer of Illinois; David O. Thomas, County Superintendent of St. Clair County; H. E. Bilger, Road Engineer of the State Highway Department; G. N. Lamb, County Superintendent of Kane County; Jesse Taylor, President, Ohio Good Roads Federation; B. H. Piepmeier, Assistant Engineer of the State Highway Department; W. E. Emery, County Superintendent of Peoria County; R. W. Osborn, County Superintendent of Livingston County; F. L. Roman, Testing Engineer of the State Highway Department; R. L. Bell, Division Engineer of the State Highway Department, and P. B. Wilson, County Superintendent of Williamson County.

State Highway Department Established in North Carolina

A law providing for the establishment of a state highway commission was passed at the recent session of the North Carolina Legislature, and Governor Craig has named the members of the State Highway Commission.

As noted in "Good Roads" for February 20, the bill provides for the establishment of a state highway commission consisting of the Governor, three citizens of the state appointed by the Governor, the State Geologist, a professor of civil engineering from the University of North Carolina and a professor of civil engineering from the North Carolina Agricultural and Mechanical College, the two professors to be selected by the Governor.

Professor M. H. Stacy of the University of North Carolina, Professor W. C. Riddick of the North Carolina Agricultural and Mechanical College, E. C. Duncan of Carteret County, Col. Benehan Cameron of Durham County and Guy V. Roberts of Madison County have been appointed to the commission by Governor Craig. These five appointees, with Governor Craig and State Geologist Joseph Hyde Pratt, constitute the commission.

Proposed Street Work in Atlanta, Georgia

Street work which will cost between $500,000 and $600,000 will be undertaken in Atlanta, Ga., during 1915, according to recent reports. The work will be done jointly by the city and Fulton County.

The work to be done in the city will include grading, paving, repaving, resurfacing and other work on about 25 miles of streets. Among the larger projects are improvements on portions of several streets as follows: West Mitchell St., 10,200 sq. yds.; Hemphill Ave., 30,396 sq. yds.; 14th St., 10,722 sq. yds.; Gordon St., 13,945 sq. yds.; Ponce de Leon Ave., 26,289 sq. yds.; Spring St., 91,740 sq. yds., and South Pryor, 14,020 sq. yds.

New Jersey Freeholders' Association Formed

An organization known as the State Association of the Boards of Chosen Freeholders of New Jersey was formed at a recent meeting, at Trenton, of representatives from nineteen of the twenty-one boards of chosen freeholders of that state.

The objects of the association are to secure the cooperation of the counties of the state in furthering the enactment of such road legislation as is deemed desirable, to hold annual conventions for the discussion of all subjects affecting the various phases of county administration, and to establish and maintain a central bureau of information to collect and distribute information relative to all branches of county government.

The following officers were elected: President, Jos. R. Thatcher, of Warren County; Vice President, Charles A. Smith, of Union County; Secretary, Frank W. Fowkes, of Cape May County, and Treasurer, Anthony J. Gebhardt, of Middlesex County.

Contract Awarded for a Portion of the Sunset Highway in Washington

A contract for the construction of 12½ miles of macadam road on the Sunset Highway has recently been awarded to the Jacobson-Bade Co., of Portland, Ore. The road, which is known as Permanent Highway No. 2, is between Davenport and Reardan in Lincoln County, Washington. The contract, which calls for gravel macadam, was awarded for $42,534. The road was graded last year but was not macadamized.

Other bids for the work were received as follows: Spokane Asphalt & Paving Co., Spokane, Wash., $44,243; Clyde H. Williams Co., Spokane, $47,432; Mitchell Bros., Spokane, $47,000; Carlson, Chindahl & Co., Spokane, $46,492.75; G. L. Strichler, Davenport, $50,560; H. L. Wilson Co., Walla Walla, $46,985, and A. H. Zane & Co., North Yakima, $45,424.

Proposed Street Work in Jacksonville, Florida

The Highway Department of the city of Jacksonville, Fla., has submitted a list of streets to be paved, at a cost of $1,947,535.57. The streets recommended for paving and the materials to be used are as follows:

Asphalt on concrete foundation: Park, King, Cherry, James, College, Myra, Stockton, 10th, Boulevard, 11th, Evergreen, 5th, Perry, 4th, 3rd, 2nd, 1st, Main, Liberty, Iona, Phelps, State, Orange, Ocean, Beaver, Ashley, Laura, Hogan, Julia, Cedar, Lackawanna, Roselle, Post, Lemon, Water, Goodwin, Copeland, River Boulevard, Palm, Herschell, North, Adams and Forsyth Sts.

Vitrified brick on concrete foundation: Talleyrand, Franklin, 11th, Henry, 10th, Darwin, Union, Catherine, Broad, Walnut and Church Sts. and Florida Ave.

Vitrified brick on sand base: Payne, Beaver, Marshall, Haines, Howard, Bridier, Spearing, Elm, Jackson, Stockton, Forest, Dennis, Enterprise, Adams, Acorn, Cleveland, Moncrief, Griffin and Jefferson Sts.; Kings Road, and Durkee and 3rd Aves.

The Allotment of State Highway Funds in Minnesota

The State Highway Commission of Minnesota has recently completed the division of the general road and bridge fund of the state among the different counties.

According to the state highway law, each county is entitled to receive not less than one nor more than three per cent. of the state road and bridge fund available in any year. The funds, which are available August 1, 1915, have been allotted to the 86 counties of the state as follows:

Aitkin, $17,000; Anoka, $15,500; Becker, $14,800; Beltrami, $18,000; Benton, $14,800; Big Stone, $14,800; Blue Earth, $28,000; Brown, $16,000; Carleton, $17,500; Carver, $14,800; Cass, $17,000; Chippewa, $14,800; Chisago, $16,000; Clay, $18,000; Clearwater, $14,800; Cook, $16,500; Cottonwood, $14,800; Crow Wing, $17,000; Dakota, $20,000; Dodge, $14,800; Douglas, $14,800; Faribault, $16,000; Fillmore, $17,000; Freeborn, $16,000; Goodhue, $18,500; Grant, $14,800; Hennepin, $35,000; Houston, $15,500; Hubbard, $15,000; Isanti, $15,000; Itasca, $28,000; Jackson, $16,000; Kanabec, $14,800; Kandiyohi, $16,000; Kittson, $14,800; Koochiching, $21,000; Lac Qui Parle, $16,000; Lake, $15,500; Le Sueur, $16,000; Lincoln, $14,800; Lyon, $16,000; McLeod, $15,000; Mahnomen, $14,800; Marshall, $17,000; Martin, $16,000; Meeker, $14,800; Mille Lacs, $14,800; Morrison, $16,000; Mower, $17,000; Murray, $16,000; Nicollet, $19,000; Nobles, $16,000; Norman, $14,800; Olmsted, $17,000; Otter Tail, $20,000; Pennington, $14,800; Pine, $21,000; Pipestone, $14,800; Polk, $20,000; Pope, $14,800; Ramsey, $35,000; Red Lake, $14,800; Redwood, $16,500; Renville, $20,000; Rice, $16,500; Rock, $14,800; Roseau, $15,000; St. Louis, $35,000; Scott, $14,800; Sherburne, $17,500; Sibley, $14,800; Stearns, $22,000; Steele, $16,000; Stevens, $15,000; Swift, $15,500; Todd $14,800; Traverse, $14,800; Wabasha, $15,500; Wadena, $14,800; Waseca, $14,800; Washington, $17,500; Watonwan, $14,800; Wilkin, $14,800; Winona, $27,000; Wright, $15,500, and Yellow Medicine, $17,500.

Proposed Paving in Philadelphia, Pennsylvania

The Councils Committee on Highways has recently decided upon the streets to be paved and repaved. The schedule calls for paving and repaving as follows:

Wood block, with granite between the railway tracks: Portions of South St., Passyunk Ave. and Walnut St.

Wood block: Portions of Carpenter, 6th, 4th, 11th and Marshall Sts.

Asphalt, Warrenite, Amiesite, Unionite or Filbertine: Portions of Ranstead, Ludlow, Juniper, Latimer, Brown, Parrish, Brandywine, Fernon, Dickinson, McKean, Mifflin, DeKalb and 28th Sts. and Columbia Ave.

Asphalt, vitrified brick and granite block: Portions of Sansom, Walnut, 11th, Fairmount, 17th, 18th, Tasker, Morris, 29th, Moyamensing and Thompson Sts.

Vitrified brick: Portions of Watkins, Webster, Orianna, Lawrence, Hicks, Dorrance, Mountain, Lambert, Beechwood and Buenther Sts. and Cleveland Ave.

Granite block: Portions of Queen, Orianna, Kater, Pemberton, Fairhill, Bread, Quarry, Cypress, Chadwick, Sansom, Van Pelt, Chanceloir, Hutchinson, 7th, Wallace, Hancock, Orkney, Reno, Randolph, Cadwalader and Marlborough Sts., and York, Germantown and Pt. Breeze Aves.

Town Highway Appropriations in New England

In addition to the appropriations which have been noted in previous issues of "Good Roads," town appropriations for highway purposes have been reported from Maine, Massachusetts, New Hampshire and Vermont as follows:

Maine: Avon, $1,000; Bluehill, $3,000; Bromfield, $1,000; Canton, $1,300; Cranberry Isles, $500; Cumberland, $2,500; Dixfield, $3,578; Duxfield, $3,000; East Millinocket, $1,723; Embden, $2,525; Friendship, $563; Gilead, $1,000; Gouldsboro, $2,333; Howland, $1,450; Hustis, $2,433; Kenduskeag, $700; Phillips, $6,298; Limerick, $1,400; Livermore, $2,500; Mercer, $1,200; Moscow, $1,350; Naples, $1,625; New Vineyard, $1,800; Northport, $3,400; Otisfield, $1,500; Palermo, $1,000; Salem, $615; Searsport, $2,500; Sedgwick, $1,000; Sidney, $1,800; Skowhegan, $9,000; Southwest Harbor, $1,500; Sweden, $525; Upton, $900; Waterford, $2,400.

Massachusetts: Adams, $16,000; Baldwinville and Templeton, $1,631.43; Braintree, $5,000; Colerain, $3,500; Conway, $3,800; Easthampton, $11,297; East Bridgewater, $1,900; Hingham, $10,000; Lee, $5,300; New Salem, $1,400; Orange, $6,500; Prescott, $1,000; Salem, $2,000; Southbridge, $14,500; Southampton, $1,800; South Hadley Falls, $2,400; Stoneham, $6,500; Stoughton, $8,800; Turners Falls, $8,600.

New Hampshire: Colebrook, $250; Manchester, $4,500; Merrimack, $1,500; Milton, $3,000; Strafford, $3,500.

Vermont: Hardwick, $1,000; Morrisville, $1,000.

An Issue of $800,000 in Bonds for Road Building is proposed in Obion County, Tenn. It is proposed to have enabling legislation passed permitting the county to make the issue.

An Election on the Issuing of $400,000 in Road Bonds will be held in Jefferson Davis Parish, Louisiana, some time in April. It is planned to use the proceeds of the bonds, if voted, in the construction of a 100-mile highway system.

A Contract for the Construction of About 3 Miles of Sidewalk has recently been awarded in Tulsa, Okla., at 8 cts. per sq. ft. The contract, which calls for the construction of about 62,500 sq. ft. of walk, was awarded to C. O. Frye & Son. The price is said to be the lowest which has been obtained for similar work in Tulsa.

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NATIONAL HIGHWAY LEGISLATION

Owing to the press of various matters, the Sixty-third Congress has ended without passing any of the highway legislation, the enactment of which seemed not improbable early in the year. Whether or not action will be taken when the next Congress assembles cannot be predicted, but in view of the agitation which has been carried on in some quarters for the enactment of laws committing the national government to participation in road work it seems likely that legislation of some kind will be forthcoming.

The necessity for road building by the national government is not by any means universally conceded, for while there is doubtless a popular demand in certain quarters for national aid, its necessity or desirability is very generally doubted by many of those best informed upon highway affairs. At the same time, many others who are interested in road work feel that some form of national aid is likely to result from the propaganda that has been carried on so strenuously during the past few years. If so, there is very urgent need for taking every possible step that will make for the enactment of legislation in which enthusiasm shall be tempered with wisdom and in which the fact that the funds of the nation come from the pockets of the people shall not be lost sight of in the scramble to get some of the contents of the national treasury for local purposes.

If national roads are economic necessities or are luxuries which the country can afford, there is reason for federal road legislation providing for their construction. Similarly, if there is really a demand from the majority of the people of the country for legislation providing for the extension of the nation's financial aid to the states in the building of roads within their borders, it is obvious that such legislation should be forthcoming. But we are not convinced that national roads are either economic necessities or luxuries which at the present the nation is justified in providing; nor is it certain that the majority favors the extension of national aid to the states. On the other hand, the idea of national aid has found favor in certain sections, and the opportunity to make political capital of this situation will not be lost sight of by the representatives and senators representing the people of those sections. For this reason, it may safely be predicted that when Congress convenes again a strong effort will be made to effect the passage of some law that will release from the treasury a considerable amount for the prosecution of road work by the federal government or for the extension of aid to the individual states.

With the by no means slight possibility of the passage of wholly unwise and unsatisfactory laws, it is the duty of highway officials and engineers to do what they can in the molding of public opinion in such a way that national road legislation, if it must come, will come in the form of just and workable laws. The drafting of a bill or bills embodying a rational and practical plan of national aid is no light task. It involves the solution of many intricate problems, not the least of which is the equitable distribution of the burden imposed upon the people of the country by the appropriation of national funds. Highway officials and engineers are the best qualified for the performance of this work; yet they are the least active in it. Separately they can accomplish little, but by working together in accordance with some carefully considered plan they should be able to make their influence count. It is to be hoped that in the near future they will take up the question in earnest, and, in the meantime, "Good Roads" will welcome expressions of its readers' opinions on this most important subject.

THE IMPORTANCE OF GOOD ROADS

A short time ago we received some publicity matter from the National Economic League, with headquarters at 6 Beacon St., Boston, Mass., in which were listed twenty subjects selected by the National Council of the league as "the issues of paramount importance for 1915." These subjects were twenty in number and ranged from World Peace, International Arbitration, Militarism, rated at 26 per cent., and American Merchant Marine, rated at 24 per cent., to Good Roads, rated at .5 per cent. Between the subjects noted were seventeen others, arranged in the following order: Efficiency and Economy in Government, Taxation and Tax Reform, National Budget, Liquor Problem, Foreign Relations of the United States, Regulation and Control of Public Utilities, Conservation of the Public Health, Immigration, Law Reform, Child Labor, Cooperation vs. Competition, Economic Wastes, Public Schools, Short Ballot, Conservation of National Resources, Equal Suffrage and Government Ownership of Railroads.

As we understand the method of selecting these subjects, a preliminary vote was taken on seventy subjects. This vote placed good roads in fourteenth place. The twenty leading subjects from these seventy were sent out in another ballot, and the voting resulted as was noted in the preceding paragraph. We are advised that the council has a membership of about 1,600, including "representative men of all classes and occupations in all parts of the country," and that about 600 of the members participated in the vote.

Bearing in mind that all men are prone to consider the work in which they are engaged as of undue importance, we still do not feel conscious of bias in stating that among the nineteen subjects other than good roads several could be selected which are of considerably less importance than the improvement of the public highways. For instance, we are not prepared to admit that the adoption of a national budget or of the short ballot is of more importance than good roads, and it seems not improbable that a very interesting debate could be had on the proposition that good roads are more important than an American merchant marine.

We should like to have the opinions of our readers.

A STATE HIGHWAY DEPARTMENT IN FLORIDA?

Elsewhere in this issue are printed two articles on the highway situation in Florida, where, within a few days, the Legislature will convene in a session which is expected to result in the enactment of laws inaugurating state participation in road work.

Florida, as those who follow road matters know, is one of the few states which have not yet adopted the state aid plan—a plan which, since its inception over a score of years ago, has been followed extensively and with practically universal satisfaction. That Florida has held back so long seems to have been due to a variety of causes, perhaps chief of which has been the reluctance of local authorities to relinquish the powers vested in them by the old laws. From the information at hand, it appears that the legislation to be expected will be in the nature of a compromise with this attitude—that it will provide a certain amount of state aid in the way of advice, given upon request, and of convict labor; but that it will not take away any considerable portion of the power of the local officials.

Such legislation is good so far as it goes, and if public sentiment in the state does not yet demand a more radical change in the manner of administering road affairs, it is to be hoped that a law such as outlined in Mr. Foote's article will be passed. We believe in the advisability of endowing a state highway department with large powers and the providing of monetary aid by a state, but it is realized that these cannot always be achieved at the start. Where conditions make it impossible to change from purely local control—which at present is the case in Florida—to the centralized control that obtains in those states which have made the greatest progress in highway work, it is well to make provisions for a comparatively small beginning.

If this is done in Florida, there is little doubt that the results will insure the passage, later, of laws providing a larger measure of state aid and conferring greater authority upon the state highway officials.

SINGLE GUTTER PAVEMENTS

A somewhat radical departure from common practice in the design of streets is suggested in the article entitled "A Single Gutter Pavement," printed on other pages of this issue. The article referred to reviews a paper presented by W. G. Kirchoffer, C.E., at the last annual meeting of the Illinois Society of Engineers and Surveyors.

While few engineers will probably go so far as Mr. Kirchoffer, who claims that the use of two gutters is an antiquated idea, it is necessary to admit the merit of most of the advantages of the one gutter pavement as set forth by Mr. Kirchoffer. The elimination of one gutter would, of course, lessen the cost of construction and the cost of cleaning, but there would be certain details of design which would complicate matters on curves and at intersections, as was pointed out in the article by Mr. Harold Turner, to which reference is made in the article to which this refers. A disadvantage of this cross section, which was not mentioned by either writer, is that skidding motor vehicles would tend to go toward the center and interfere with traffic in the opposite direction instead of going to the curb, as is often the case on a road higher at the center than at the sides.

These and other difficulties which might present themselves would have to be overcome were the plan adopted to any extent. At the same time, the manifest advantages of the plan seem sufficient to warrant the construction of a pavement of the kind proposed, for experimental purposes.

The City Budget of Providence, R. I., for the next fiscal year amounts to $6,191,013. Among the appropriations in the budget are the following: Street cleaning, $130,000; highways, $470,655; sidewalks and curbing, $4,000 plus receipts; bridges, $33,000.

The City of Anderson, S. C., has recently voted $100,000 in bonds for street improvement, the issue carrying by 407 to 55. The proceeds of the issue will be used in the prosecution of about 200,000 sq. yds. of street work, it is reported. About $250,000 is now available for paving work in the city.

The $2,000,000 Road Bond Issue of Cook County, Illinois, is the basis of a friendly suit recently filed against Peter Reinberg, President of the County Board, County Clerk Robert M. Sweitzer and Cook County. As was noted in "Good Roads" for February 27, this action was necessitated by a question as to the validity of the bond issue. The point on which the suit hangs is whether it was necessary that the proposition receive a majority of the votes cast or a majority of the votes cast on the proposition to issue bonds. The issue carried by 247,404 votes in favor of the bond issue, against 162,250 against it. While this is a majority of the votes cast on the bond issue proposition, it was not a majority of the total votes cast at the general election. It is hoped, according to reports, that the Circuit Court will hand down a decision before the April term of the Supreme Court so that the appeal will be taken to the higher court and the matter disposed of before June,

The 1914 Operations of the Philadelphia Bureau of Highways and Street Cleaning

Detailed data on the operations of the Bureau of Highways and Street Cleaning of Philadelphia, Pa., are given in the annual report of that bureau recently submitted by Chief William H. Connell to Director Morris L. Cooke of the Department of Public Works.

The first part of the report is devoted to a brief statement of the work accomplished by the bureau during the period of two years and nine months (to January 1, 1915) of Chief Connell's incumbency. This work has comprised the maintenance, both by cleaning and repairing, of 1,408.18 miles of paved streets, roads and boulevards, 1,270.63 miles of sewers and 274 bridges, representing an initial outlay of $56,500,000 for roads and streets, $35,400,000 for sewers and $17,200,000 for bridges, making a total of $109,100,000. In addition to this work, the bureau has had charge of the collection of ashes, garbage and rubbish, the construction of pavements, boulevards and parks and the performance of other work. The total cost of all the work supervised by the bureau during the period referred to was $16,511,842.70.

Reference is also made early in the report to the work done in reorganizing the bureau, which, it is stated, "necessitated an almost complete change in the personnel of the bureau, from one that could boast of only one engineer amongst two hundred and fifty salaried employees, to a bureau with one hundred and eighty-one engineers out of a total of two hundred and seventy-one salaried employees, engaged in the supervision of the work which is all strictly engineering with the exception of the auditing and accounting, stenographic and clerical work."

At present there are 1,612.77 miles of highway in the city of Philadelphia, the character and amount of which are shown in Table I. During 1914, $4,955,735.13 was expended for work on contracts awarded by the department, the total value of the work represented by the contracts being $7,520,718.36. In addition, $605,554.06 was expended for work done by the municipal forces in the maintenance of streets, roads, bridges and sewers, making the total expenditure for the year $5,601,289.19. In addition, bids were received for work to the value of $240,183, for which contracts were not executed.

The total mileage of pavements constructed during the year was 77.13, the character and mileage of each of the several kinds built being shown in Table II. In addition, 22.22 miles of street were graded during the year.

Besides the ordinary street work of the department, several special projects were either completed or continued during the year, among these being the Northeast Boulevard, the Southern Boulevard, League Island Park, the Parkway and the Oxford Pike service test road. The available space does not permit a complete account of these works, several of which, including the Northeast Boulevard, the Parkway and the Oxford Pike service test road, have been described in previous issues of "Good Roads."

TYPICAL COUNTRY ROAD PAVEMENT, PHILADELPHIA, PA.—BITUMINOUS PAVEMENT WITH WATER BOUND MACADAM SHOULDERS.

Considerable space is given in the report to the work of street cleaning and to snow removal. Included in this portion of the report is an account of the work done during "Clean-Up Week," April 20 to 25, which was performed under the supervision of the Bureau of Highways. The actual work was preceded by an active publicity campaign, during which free use was made of newspaper articles and cartoons, letters to advertisers and manufacturers of all articles for cleaning purposes, to boards of trade, to business men's associations, to women's civic associations, to managers of theaters and moving picture houses, to banks, trust companies and real estate agencies. Gummed labels were pasted on letters sent out by the city; a special slide was

LOAD OF RUBBISH COLLECTED DURING "CLEAN-UP WEEK" IN PHILADELPHIA, PA.

shown in moving picture theaters; placards were displayed in trolley cars; circulars were sent to householders, and other similar methods of securing publicity were utilized. This served to arouse public interest and cooperation, and as a result the collections of rubbish during clean-up week were 140,000 cu. yds. in excess of the normal, an amount that, according to the report, would cover a city block 300 by 300 ft. to a depth of 42 ft. The total cost of the additional work during clean-up week amounted to something over $13,000 which, with the addition of the city's expenditures in advertising, printing, etc., and the expenditure by the citizens' committee that cooperated with the bureau, brought the total to over $17,000.

Considerable space is given in the report to the matter of unit cost records. It is stated that a complete summary of the unit costs of all principal classes of work performed by the bureau, both by contract and by municipal forces, is presented for the first time in the report. This subject, it is stated, is one which, prior to the reorganization of the bureau in 1912, had received practically no consideration. The following regarding the work is from the report:

"Records of this kind are invaluable as a means of control in conducting work coming under the jurisdiction of a large organization such as the Bureau of Highways and Street Cleaning of Philadelphia, and they have already resulted in bringing about a spirit of rivalry between the different districts which it is intended to bring about between the different street cleaning and repair gangs by the publicity to be

BITUMINOUS PAVEMENT WITH CONCRETE CURBS BEFORE BUILDING SHOULDERS, PHILADELPHIA, PA.

TABLE I.—STREET PAVEMENTS AND COUNTRY ROADS IN THE CITY OF PHILADELPHIA, PA., DECEMBER 31, 1914.

Character	Miles	Square Yards
Granite Block	346.68	6,534,737
Asphalt (Sheet)	519.59	7,722,806
Asphalt (Block)	7.39	69,950
Vitrified Block	176.65	2,615,103
Wood Block	9.94	218,057
Cobble	5.69	57,752
Rubble	4.33	62,380
Slag Block	8.13	78,071
Cement and Granolithic	11.03	54,242
Totals	1,089.43	17,413,101
Country Roads		
Concrete Roads	1.12	28,150
Bituminous Pavements	75.48	984,813
Water Bound Macadam Roads	242.15	2,822,254
Totals	318.75	3,835,217
Grand Totals (Improved Pavements and Country Roads)	1,408.18	21,248,318
Earth Roads	204.59	
Total Mileage	1,612.77	

TABLE II.—TOTAL MILEAGE OF PAVEMENTS BUILT IN PHILADELPHIA, PA., IN 1914.

Character	Miles
Asphalt	21.15
Granite Block	1.01
Vitrified Block	6.53
Wood Block	1.78
Bituminous Pavements	15.08
Water Bound Macadam	30.46
Concrete Roads	1.12
Total	77.13

TABLE III.—UNIT COSTS OF REPAIRS MADE BY CITY FORCES OF PHILADELPHIA, PA., IN 1914, UNDER THE SUPERVISION OF THE BUREAU OF HIGHWAYS AND STREET CLEANING OF THE DEPARTMENT OF PUBLIC WORKS.

District	Sq.Yds.	Labor	Teams	Material	Total	Average Unit Cost
Resurfacing Water Bound Macadam						
1	9,021	$1,620.66	$1,121.00	$2,805.90	$5,547.56	$0.615
[illegible]	700	130.32	15.75	131.25	277.32	0.396
3	......	......	......	....	....	....
4	......	......	......	....	....	....
5	10,075	1,136.64	1,682.00	2,299.73	5,118.37	0.508
[illegible]	32,702	3,361.24	674.03	6,781.43	10,816.70	0.331
7	55,951	3,994.05	3,704.75	11,743.11	19,441.91	0.348
Total ..	108,449	$10,242.91	$7,197.53	$23,761.42	$41,201.86	$0.380
7	3,378	123.21	105.25	106.99	335.45	0.100
spiked up and rolled, very little material used.						
Patching Water Bound Macadam						
1	9,609	$2,113.45	$1,511.36	$1,445.15	$5,069.96	$0.528
2	......	......	......	....	....	....
3	......	......	......	....	....	....
4	......	......	......	....	....	....
5	4,477	824.74	679.58	575.12	2,079.44	0.464
6	14,357	1,701.42	599.89	1,419.09	3,720.40	0.259
7	9,449	1,095.71	1,117.67	1,428.66	3,642.04	0.385
Total	37,892	$5,735.32	$3,908.50	$4,868.02	$14,511.84	$0.383
General Patching Water Bound Macadam (Done previous to Symbol Code)						
6	17,515	$ 720.52	$ 233.39	$ 1,162.02	$ 2,115.93	$0.121
Granite Block on Sand and Concrete Bases						
1	32,989	$ 8,781.65	$ 927.20	$1,144.32	$10,853.17	$0.329
2	23,927	8,450.70	1,680.83	1,371.56	11,503.09	0.481
3	43,766	10,532.64	2,647.14	2,257.25	15,437.03	0.353
4	50,541	14,632.08	2,494.40	2,865.20	19,991.68	0.396
5	53,084	13,020.03	2,489.50	2,029.71	17,539.24	0.330
6	23,214	6,774.36	1,158.24	245.66	8,178.26	0.352
7	244	77.00	10.00	....	87.00	0.357
Total	227,765	$62,268.46	$11,407.31	$ 9,913.70	$83,589.47	$0.367
Vitrified Brick on Sand and Concrete Bases						
1	6,142	$ 1,639.20	$ 257.78	$ 813.95	$ 2,710.93	$0.441
2	3,271	1,100.90	244.23	502.13	1,847.26	0.565
3	651	213.51	67.30	88.77	369.58	0.568
4	2,094	586.19	193.81	584.87	1,364.87	0.652
5	3,690	962.19	239.84	220.76	1,422.79	0.386
6	23,206	5,803.77	1,093.82	624.31	7,521.90	0.324
7	......	......	......	....	....	....
Total	39,054	$10,305.76	$2,096.78	$2,834.79	$15,237.33	$0.390
Asphalt.						
On bituminous base	4,480	$ 2,330.72	$ 490.77	$ 167.20	$ 2,988.69	$0.667
On concrete base	2,470	1,301.76	237.20	72.30	1,611.26	0.652

given throughout the bureau to the costs of like work of the different units of the organization.

"Considerable stress is being laid on this point, as we well know that if we are to keep abreast of the times and attain the highest point of efficiency in our work, cost records and reports are essential; and in order that one of the principal reasons for keeping these records may be made clear to those who are not entirely familiar with the effect they will have on the performance of the work of the bureau, the following explanation is made.

"The moral effect on an organization is alone a justification for keeping unit cost records. This is illustrated through the pride aroused in the men in connection with their work. The natural instinct of man is to excel in his undertakings, but we must remember that men will be led and not driven, and if we are to get the best out of them we must arouse their interest in their work and impress them with a sense of their responsibility; and there is no better way to do this than through the friendly competition resulting from unit cost records. Men are naturally ambitious. This is clearly illustrated in our pastimes and sports, whether it be shooting marbles, pitching quoits, playing baseball, or any other form of amusement that brings out competition—we all want to excel, and work hard to do so. One reason is because we understand what we are doing and are interested; the other is because our ambition is aroused through competition, with the result that we will do the best we can. This same situation should exist in all classes of work. There is no man—no matter how lowly he may be, or whatever may be the nature of his work—whose interest we cannot arouse by impressing him with a sense of his responsibility and showing him wherein the competition lies in connection with his work. The reason men are often lackadaisical about their work is because they do not understand just what they are playing and consequently have no particular interest in the game, whereas, if they understood more about the relationship of their work to the undertaking as a whole their interest would be aroused and they would appreciate their responsibility. The only difference in our amusements bringing out competition, and work, is that in the first instance we understand the game and our part in it, and play it for all it is worth; while in the latter instance we do not understand the game or our part in it and consequently our interest is not aroused and we do not play it for all it is worth, which is not only a loss to us, but to our employers. Therefore, anything we can do to arouse the interest of the men in their work and bring about friendly competition is of inestimable value, and nothing will do more to produce this result than unit cost records.

"In some quarters there has been a rather general impression that the necessary job orders, route sheets, time sheets, material reports and progress reports which the foremen are required to handle are apt to confuse him and consequently tend to decrease rather than increase the efficiency of his work. This is not so. On the contrary, it tends to develop the foreman, awaken his interest, and in many instances makes a new man of him. And why? Simply because he is placed on his mettle, taken in to a certain extent on the financial and business end, made a more important factor in the organization, and consequently his work means more to him than the mere physical results. It is this spirit of friendly competition and renewed interest in the work, through a better understanding of what it all means, that we have been endeavoring to impress upon the men engaged in and directly supervising the physical work coming under the jurisdiction of this bureau.

COMPUTED FROM SPECIAL TEST DATA																		FROM DIST. DAILY REPORTS	
DISTRICT	GRANITE BLOCK				BRICK				WOOD BLOCK				ASPHALT				AVERAGE UNIT COST ALL CLASSES	AVERAGE UNIT COST ALL CLASSES	DISTRICT
	TRAFFIC			UNIT COST	TRAFFIC			UNIT COST	TRAFFIC			UNIT COST	TRAFFIC			UNIT COST			
	Heavy	Med.	Light		Heavy	Med.	Light		Heavy	Med.	Light		Heavy	Med.	Light				
1-A	.337	.183	.200	.201			.208	.208							.198	.198	.202	.208	1-A
1-B		.237		.237			.218	.218							.147	.147	.220	.194	1-B
2	.290	.259		.281		.225		.225		.200		.200		.187		.187	.262	.290	2
3	.255	.220		.238					.217			.217					.233	.302	3
4-A	.282	.250	.200	.254		.226		.226		.264		.264					.253	.251	4-A
4-B	.283	.231	.209	.261		.221		.221						.243	.178	.186	.236	.226	4-B
5	.305	.227	.207	.250		.231		.231						.194		.194	.228	.336	5
6		.259	.233	.251		.277	.178	.210									.239	.232	6
AVERAGE UNIT COST				.245				.217				.217				.187	.232	.269	
The above does not include water— Water at .04 per 1000 gallons = .004 per 1000 sq. Yds.																			

The above includes the cost of the removal of the street dirt averaging .23 cu. yds. per 1000 sq. yds. Cost of .087 per 1000 sq. yds.

The above costs include operating and direct supervision only and are based on the following
Foremen 2.50 per day
Gangmen 1.75 " "
Mach. Broom 5.50 " "
Dirt Wagon 5.00 " "
Dirt Cart 3.50 " "
Sprinkler 5.00 " "

TABLE IV.—COST DATA ON STREET CLEANING WITH MACHINE BROOMS, PHILADELPHIA, PA.—COSTS GIVEN FOR AREAS OF 1,000 SQ. YDS.

"An illustration of the advantage of keeping records of this kind was in connection with the bituminous surface treatment work, which is the principal factor in modern highway maintenance of water bound macadam streets and roads. The unit cost records of this work performed in 1913 showed an average cost of 7.3 cts. per sq. yd., while in 1914, the average cost was 5.8 cts. per sq. yd., or a saving of 1.5 cts. per sq. yd. over 1913. This saving was a direct result of making an analysis of the items of cost for 1913, through which it was possible to point out the weak points in the performance of the work, with the result that in 1914 more attention was given to the different operations of the work, the cost of which was considered to be too high the previous year. Of this saving of 1.5 cts. per sq. yd., about .5 ct. per sq. yd. was due to the fact that a number of the treatments were second applications and naturally required

TYPICAL CEMENT GROUTED VITRIFIED BRICK PAVEMENT, PHILADELPHIA, PA.

CONCRETE PAVEMENT UNDER CONSTRUCTION—OXFORD PIKE SERVICE TEST ROAD.

a lesser amount of bituminous material per sq. yd.—and the reduction in the cost of gravel. But approximately 1 ct. per sq. yd. (or a saving of 14 per cent. of the entire cost of the work) was entirely due to the increased efficiency of the organization in handling the work. A further study will be made of the costs of this work and also the unit costs of all work performed by the bureau, with a view to pointing out ways and means of conducting the work in a more efficient and economical manner next season."

Unit costs for repair work on water bound macadam, granite block, vitrified brick and asphalt streets are shown in Table III. Unit costs of street cleaning with machine brooms are shown in Table IV. A table accompanying the report which shows the costs of bituminous surface treatment work during the season of 1914 was printed in "Good Roads" for March 6 as a part of the discussion on "Dust Prevention and Street Cleaning" by Chief Connell at the Chicago convention of the A. R. B. A. last December.

Engineering and overhead charges are discussed in the report as follows:

"A very important matter that must ultimately be considered if this work is to continue to be carried on along the high plane it has been in this city during the past two years and nine months, is the augmenting of the present supervising force sufficiently so that they will be required to do only a normal day's work with the addition of the overtime that would ordinarily be expected of employees in any business establishment. Up to the present time, due to the small force engaged in the supervision of the work of this bureau, it has been necessary for a number of the employees to put in an enormous amount of overtime, which cannot be continued indefinitely. Without going into detail in this connection it will be necessary only to call your attention to the fact that during the past three years $16,511,842.70 has been expended on the work coming under the jurisdiction of this bureau, while only $800,582 has been expended on all overhead charges in the bureau, including salaries for the supervising force; charges credited to the Survey Bureau, representing the cost to the city for work they have done in connection with furnishing plans and estimates and lines and grades for highway construction work; transportation of all classes, including automobiles; office furniture, equipment and stationery; making a charge of only 4.8 per cent. for the engineering and overhead charges of the bureau in connection with carrying on this work. These overhead charges are from 2 to 7 per cent. lower than those for any other like department, municipal or state. While 5 per cent. may be considered a fair charge for engineering, it must be remembered that the overhead charges cited for this bureau include other than what are considered engineering charges when discussing their proportion to the cost of the work, as there is an enormous amount of routine detail work performed by this bureau, such as the investigation and answering of complaints, serving footway and curb notices, and numerous other details that should not be considered a direct engineering charge, but should be a part of the overhead over and above the 5 per cent. for engineering.

"The solution of this problem would seem to be to make

MODERN GROUTED GRANITE BLOCK PAVEMENT WITH OLD GRANITE PAVEMENT BETWEEN RAILS.

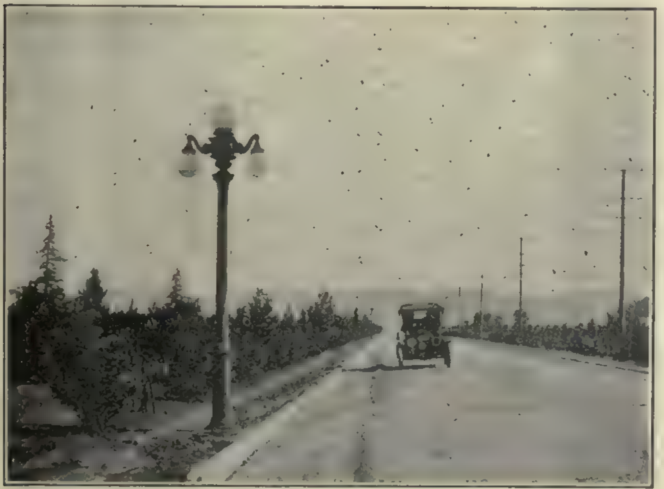
TYPICAL WOOD BLOCK PAVEMENT IN FRONT OF A HOSPITAL, PHILADELPHIA, PA.

proper provision for paying the cost of engineering out of loan appropriations for the specific work. This would make it unnecessary to increase the budget appropriations and would place the cost for supervision against the appropriation for the improvement, where it rightfully belongs."

Among the recommendations in the report is the following relative to the character of pavements:

"It is impossible to determine the character of pavement to be laid on any specific street or to determine the time when such a pavement should be laid without taking into consideration other streets in the neighborhood and thus correlating the recommendations made.

"The bureau has made studies of the streets where repaving is required, and in these studies the situation as a whole has been considered, so that different types of pavements are provided to meet different traffic, weather and other conditions. If, therefore, legislation determines the time of repaving a specific street and this determination is not in accord with the bureau's preconceived design, it entirely disarranges the construction program and seriously handicaps the bureau in the performance of its duties. It is not only to be recommended, but strongly urged, that no appropriations be made to the bureau for such work as repaving or resurfacing or country road work, which definitely limit the work to be performed under these appropriations unless these limitations are placed in the appropriation in accordance with a definite recommendation of the bureau. While the cases cited are those which most affect the proper control of the bureau's work, there are several conditions due to legislation that would materially better conditions throughout the city."



VIEW ON SHERMAN WAY—A ROAD IN THE SAN FERNANDO VALLEY, NEAR LOS ANGELES, CAL.—SHOWING LIGHT STANDARDS AND ROSEBUSHES.

The Beautification of Sherman Way in Los Angeles County, California

The beautification of a country road in Los Angeles County, California, has recently been completed.

The road, which is known as the Sherman Way, extends 28 miles through an agricultural district in the San Fernando Valley, near the city of Los Angeles. The district was originally embraced in a 47,000-acre ranch, which was taken over by a real estate company and divided into small farms. The road was built by the company, and about three years ago the work of beautifying the road was undertaken. It was completed last winter and the road formally turned over to the county, which in future will maintain it.

CURVE ON SHERMAN WAY, NEAR LOS ANGELES, CAL.

The beautification has consisted of the planting of rosebushes and trees along the roadside and the erection of ornamental lamp posts over the entire length. Over a considerable portion of the distance the road is divided into two roadways by a suburban electric car line, which runs through the center. The rosebushes are planted at intervals of 7 ft. along each side of the car line and along each side of the road, as shown in one of the accompanying illustrations, making four lines in all. The parkway each side of the road is 30 ft. wide and in it have been planted, besides the rosebushes, two rows of trees. The different varieties of roses are grouped together along the road in lengths of not less than 100 ft. In all, there are approximately 80,000 rosebushes. The total cost of this work was practically $100,000.

The ornamental light standards are of the type shown in the illustrations, except in the three small towns through which the road passes, where five-light standards similar in design are used. Each of the five-light standards carries one 60-watt and four 40-watt tungsten lamps, while each three-light standard carries one 60-watt and two 40-watt lamps. In general, the standards are placed at 330-ft. intervals. The cost of installation amounted to about $114 per standard and was paid for by local assessments, by means of which the lights will also be maintained.

A Bond Issue of $400,000 has recently been voted in the Bryan District of Brazos County, Texas. The issue carried by a vote of 634 to 169.

The City Council of Greenville, S. C., has voted $125,000 in bonds. The proceeds of the bonds will be used for the construction of asphalt and cement pavements and sidewalks on Spring and Summer streets.

VIEW ON SHERMAN WAY, SHOWING ROSEBUSHES BORDERING TROLLEY TRACKS.

The Highway System of Tarrant County, Texas

There has recently been completed in Tarrant County, Texas, a system of main highways which has cost $850,000 and which was built under one contract.

The system was built under a special act of the Texas Legislature authorizing the county to construct a system of "cardinal and sub-cardinal" roads radiating from Fort Worth, the county seat, to the county line. The system has a total length of 137.2 miles, which is divided among the several roads as follows: Grape Vine, 23.9; Dallas, 15.4; Mansfield, 22.4; Burleson, 11.3; Cleburne, 14.3; Weatherford, 13.9; Azle, 13.7; Keller, 17.7, and Haslet, 4.6. Funds for the work were provided by a bond issue of $1,000,000. The work was commenced late in May, 1913, and completed in the latter part of February of this year.

In order to determine upon the type of construction best adapted to each different road, a traffic census was taken on all of the highways leading into the city of Fort Worth, and as a result of this three types of road were selected—asphalt macadam, water bound macadam with a surface treatment of asphaltic oil, and gravel. The routes of the old roads were followed in a general way as far as practicable, but grades were reduced to a maximum of 6 per cent. Reverse curves were also eliminated to as great an extent as possible, and all sharp curves were flattened. All rights of way are at least 50 ft. in width and all roads have an available width of at least 16 ft. The bridges are of reinforced concrete and the culverts are all of concrete except the smaller ones which are of vitrified or corrugated pipe.

Various soil conditions had to be met, the soil including sand, clay, and the black, waxy material known locally as gumbo. The county is well supplied with a gravel of a good cementing value but rather soft for surfacing work. The old roadbeds were used for foundations wherever changes in grade or alignment, or both, did not prevent. Elsewhere, local materials were used—gravel when available and in other cases a soft, chalky limestone or a disintegrated stone found within a reasonable distance from the work. In all cases the foundation course was at least 4 ins. thick after compression. The foundation material was placed as much in advance of the laying of the wearing surface as possible, this permitting the discovery of weak places in the base and their repair before the distribution of the wearing surface.

The wearing surfaces of the macadam roads were built of crushed limestone, graded into four sizes and laid in four courses having a total thickness, after compression, of about 4 ins. The first course, comprising about 75 per cent., by volume, of the surfacing, consisted of stone passing a 3¼-in. ring and retained on a 1½-in. ring. This course was harrowed before applying the second course. The second course, comprising about 10 per cent., by volume, consisted of stone passing a 1½-in. ring and retained on a ½-in. ring. The third course, constituting about 10 per cent. of the stone, consisted of material passing a ⅝-in. ring and retained on a ¼-in. ring, the dust being removed. The fourth course, constituting the remainder, or about 5 per cent. of the bulk, consisted of particles smaller than ¼ in. Each course was rolled after being spread, and where a bituminous binder was used it was put on in two applications after the completion of the second course. The first application consisted of about .85 gal. per sq. yd. of a refined tar and the second of about 1 gal. per sq. yd. of asphaltic cement having a penetration of 95 (Dow standard). The bituminous material was applied under pressure—the tar at a temperature of 250° F. and the asphalt at 325° F. For surface treatments an asphaltic oil was used, one application of about .5 gal. per sq. yd. being made, and covered with stone chips.

The total road mileage is divided among the different types

ASPHALTIC MACADAM PAVEMENT IN TARRANT COUNTY, TEXAS—VIEW ON THE WEATHERFORD ROAD, ONE OF THE ROADS OF THE COUNTY'S IMPROVED SYSTEM.

WATER BOUND MACADAM ON THE KELLER ROAD, TARRANT COUNTY, TEXAS.

TYPICAL SHORT SPAN BRIDGE—TARRANT COUNTY HIGHWAY SYSTEM.

of road as follows: Asphalt macadam, 18 ft. wide, 15 miles; asphalt macadam, 16 ft. wide, 5.4 miles; water bound macadam, 16 ft. wide, oiled, 13 miles; water bound macadam, 10 ft. wide, with 3-ft. gravel shoulders, oiled, 69.2 miles; gravel, 16 ft. wide, 34.6 miles. The average costs per square yard were as follows: Asphalt macadam, 85 cts.; water bound macadam, 60 cts.; gravel, 40 cts.

The contract for the engineering work was awarded to James C. Travilla, formerly Street Commissioner of St. Louis, Mo., at 5 per cent. of all money spent under his supervision. The engineering organization consisted of a first assistant, two field assistants, an office engineer, a general superintendent of construction and an assistant in charge of bituminous work, with field helpers, rodmen and inspectors. Two automobiles were maintained during the work for taking out field parties and for the use of the engineer, assistants and superintendent. One of the difficulties with which Mr. Travilla had to contend at the beginning of the work was the lack of training on the part of the foremen of the construction company. To remedy that condition he instituted a school of instruction for them, holding sessions at his office every Sunday afternoon for several months. The results of this plan are reported to have been very satisfactory.

It is reported that several of the roads have already been given severe tests and have satisfactorily withstood them. In some cases stretches of hundreds of feet of the new roads stood under several feet of water during the spring freshets, in some cases for two or three days. It is also reported that while there was considerable opposition to the original bond issue this has been overcome and the desirability of a further issue of bonds is now considered.

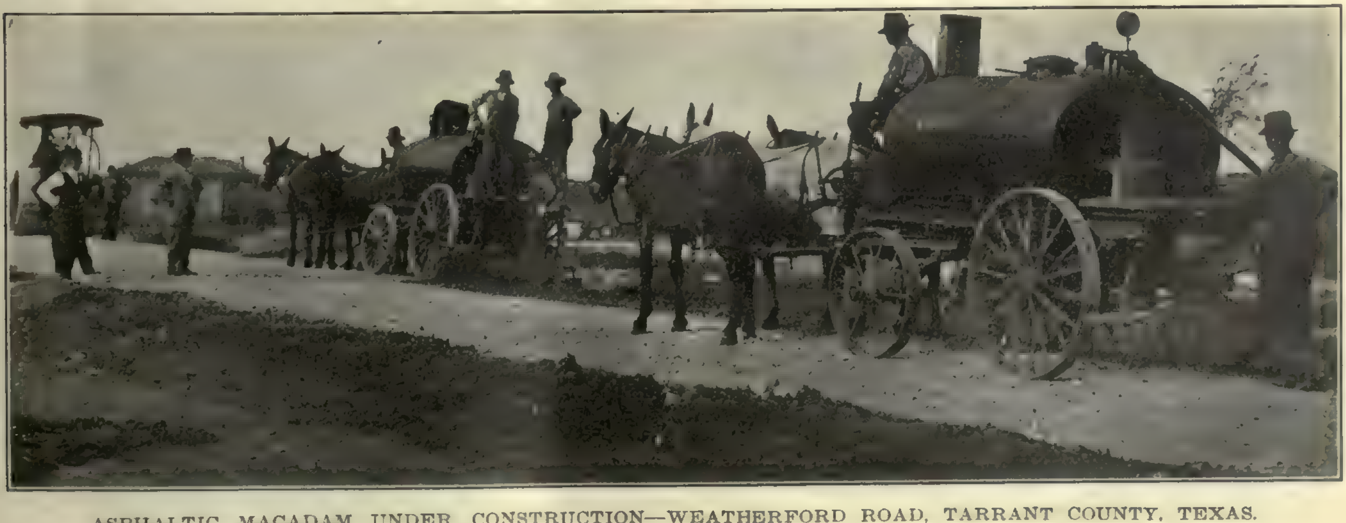
New Specifications of the Illinois State Highway Department

The Illinois State Highway Department has recently sent out revised specifications for the construction of brick and Portland cement concrete roads.

The specifications, which are dated March, 1915, comprise the forms for advertisements, for proposals and for contracts, as well as the specifications proper. The latter are divided into three parts, comprising the general clauses, the clauses relative to the construction of concrete roads and the clauses relative to the construction of brick roads. The specifications for concrete roads call for a one-course roadway with expansion joints at 100-ft. intervals, filled with either asphalt or coal tar filler. The brick specifications call for a brick pavement of the usual type, laid upon a 1½-in. sand cushion upon a concrete foundation and filled with a 1:1 cement grout filler.

Proposed Paving in Lincoln, Neb., which will be undertaken shortly, includes work on the following streets: 20th and 22nd Sts., $16,000; Vine St., $2,200; K St., $13,800; Holdrege St., $24,500; Y St., $39,000.

A Total of $517,362.37 was expended during the past year for road and bridge work in the Province of Nova Scotia, according to a recent report of the Highway Division of the Department of Public Works and Mines.



ASPHALTIC MACADAM UNDER CONSTRUCTION—WEATHERFORD ROAD, TARRANT COUNTY, TEXAS.

A Single Gutter Pavement

The construction of pavements with a single gutter placed at the center instead of two gutters at the side—a method of construction that has previously been advocated—was suggested in one of the papers presented at the recent annual meeting of the Illinois Society of Engineers and Surveyors. The paper, which was entitled "A Street With a Single Gutter," was presented by W. G. Kirchoffer, C.E., Consulting Sanitary Engineer to the State Board of Health and the State Board of Control of Wisconsin.

The use of two gutters, according to Mr. Kirchoffer, is an antiquated idea. When roads and streets were first built it was necessary to make them of soft materials and, the only means of drainage being to the side of the road, it was natural that they should be crowned at the center. At present, with hard materials such as asphalt, brick, concrete and wood block, such construction is "not essential or necessary" and, in Mr. Kirchoffer's opinion, we are not advancing with the times when we stick to the old method of highway construction, especially for city pavements.

In support of his contention, Mr. Kirchoffer argues that there is no logical reason for separating the water and filth from a street into two parts and that the crown of a street does not even serve to divide the traffic. The form of street to be adopted if progress is to be made, according to Mr. Kirchoffer, is a street with a single gutter in the center, the pavement being highest at the curbs and extending downward to the center gutter from each side "with a continuous even slope." The advantages of a pavement constructed in this way were stated by Mr. Kirchoffer as follows:

1.—The capacity of the pavement to carry storm water is many times that of a pavement constructed in the old way.

2.—It will keep the dirt and filth in the center of the street where it was made and where it can be easily cleaned or washed away.

3.—With this construction, it will be easier and more convenient to establish street grades to conform to existing conditions than it is with the present method of street construction.

4.—It will be more economical in the cost of catch basins and sewers, as one or possibly two catch basins will take the place of four or more.

5.—No need of deep gutters with costly gutter covers for sidewalks, which are an obstruction to the street.

6.—Lower curbs or none at all in residence sections, except such as might be formed of sod.

7.—Greater convenience in driving up to the curb. No mess of water, filth, papers, cigar stubs, etc., to alight into from a carriage or auto.

8.—More sanitary because storm water, or water from street washing, would be more concentrated and therefore wash the street cleaner.

9.—The appearance of the street will be improved from an aesthetic point of view.

10.—Less crown (or anti-crown in this case) will be needed.

11.—Street will be more easily cleaned, as the debris will be concentrated in one windrow in place of two as now.

12.—This form of street pavement will tend to divide traffic to right and left-hand side of the street.

13.—Great advantage on boulevarded streets, where four gutters are now necessary.

The "possible disadvantages" of this method of construction are given as follows:

1.—A narrow street with street car tracks. The gutter would be between the rails, which would cause debris to accumulate in the wheel grooves. A wide street with car tracks would have two gutters, one on each side.

2.—During heavy storms the water in the center of the street might be too deep to walk through, but this condition often occurs where two gutters are constructed.

Mr. Kirchoffer states that the idea of a single gutter is not original with him; that it is often used in alleys and driveways with good results. In this connection it is interesting to note that a similar suggestion made by Harold Turner, Assistant Engineer and Surveyor of the Surbitan (England) Urban District Council, was noted in these columns nearly six years ago. The cross section suggested by Mr. Turner consisted of two slightly crowned surfaces sloping downward from the curb line to a center gutter. In his discussion of this form of construction, Mr. Turner set forth various advantages which it would have as compared with the usual construction. Most of these advantages are either covered by Mr. Kirchoffer or are so obvious they will readily suggest themselves to the engineer. Among the disadvantages noted by Mr. Turner were the difficulty of adjusting the cross sections on intersecting streets and the increased overturning tendency of vehicles on curves. He proposed the retention of the center channel and the construction of center lamps and refuges at intersections, and to overcome the tendency of vehicles to tip over on curves he proposed the abandonment of the suggested section at such curves and the substitution of the true concave section—which would obviously be effective only if vehicles kept well to the center of the street.

Recent Highway Legislation in Arkansas

Among the enactments affecting road work made by the Legislature of Arkansas is a proposed amendment to the constitution which will have a very marked effect upon road work of the state, according to reports.

The amendment has been adopted by both branches of the Legislature and has been approved by the Governor, but must be voted upon by the people of the state at the next general election. It permits counties to issue bonds for the construction of roads up to an amount that can be cared for by a 3-mill levy on all taxable property within the several counties, the life of the bonds not to exceed 30 years.

It is reported that no opposition to the adoption of the amendment is expected.

Proposed Road Work in Northeastern Ohio

Over $2,000,000 will be spent during the coming season in Cuyahoga and adjacent counties in the northeastern portion of Ohio, according to recent reports.

New road work in Cuyahoga County will be undertaken to the amount of more than $1,000,000, it is stated, while the cost of repair jobs will amount to over $70,000. Lake County is to build 18 miles of concrete road on the highway between Buffalo and Cleveland and 8 miles of brick road between Painesville and Willoughby. Lorain County is to expend about $12,000 for the construction of something less than a mile of concrete roadway and $16,000 for the repair of 2 miles of the La Grange-Elyria-Akron road. Medina County will undertake the construction of 30 miles of concrete and water bound macadam pikes with state aid. Geauga County will commence the work of grading 20 miles of the Cleveland-Youngstown road at a cost of $65,000. The present plan is to pave the road with brick next year.

The 4th St. Viaduct at Canon City, Colo., has recently been opened to traffic. The bridge carries 4th St. across the Arkansas River and the Denver & Rio Grande and the Santa Fe Railroad tracks and has been under construction for the past five months. The bridge has a total length of 847 ft. and consists of 16 spans, of which the longest is 65 ft. and the shortest 18 ft. The bridge is of concrete and cost something over $26,000.

The Inadequacy of the Pavements in Shanghai, China, is given by Consul General Thomas Sammons of Shanghai, in a recent issue of "Commerce Reports," as the reason for the temporary abandonment of the railless cars recently put into operation in that city. According to Consul General Sammons, the foundations of the streets were originally of broken brick, which has since become pulverized and will not support the weight of the cars, and it seems that thorough reconstruction of the streets will be necessary before the cars can be operated successfully. It is stated that, aside from the difficulty with the roads, the cars are well suited for use in the congested streets of Shanghai as they are able to pick their way through narrow streets where it would be impracticable to operate ordinary street railways.

Highway Conditions in Florida

BY CHARLES E. FOOTE

Florida is one of the very few states in the Union which has not yet enacted legislation providing for state supervision of highways; and yet no state has greater need of such supervision and in no state would such supervision be productive of more immediately beneficial results.

Florida presents many aspects of unusuality, as compared with other states. It has an area of 58,000 square miles, not including Lake Okeechobee. Its population in 1910 was 752,000 people—probably there are fifty thousand more there now. The bulk of the population is located in widely separated communities, between which are large areas of arable, but uncultivated land. Such lands, throughout the state, are estimated at approximately 27,000,000 acres, not counting swamp lands, or lands which, for various reasons, may not be considered cultivable, nor that occupied by standing timber.

There are 50 counties in the state, and as a general rule each county is divided into five "commissioner districts," each district and its affairs being under the control of a member of the board of county commissioners.

Naturally, many of the counties are sparsely settled, and have no roads except tracks through the sand. The major portion of this uncultivated land is what is locally known as "cut over"; i. e., the merchantable timber was first cut off, then that which would make telegraph poles and railroad ties, so that what is left is valuable only for fence posts and fire wood. As these lands were originally laid out under the "Congressional Survey" law, it is probable that in time, as the country becomes settled, roads will be located along section lines. As yet, however, in the more isolated and less improved sections, practically the only roads are those made by the woodsmen in getting out the timber.

About 18 counties, or road districts within counties, have within the past few years issued bonds in varying amounts for the improvement of the roads. Probably half that number have bond elections scheduled, unless some of them may have been held recently. In the aggregate, probably these counties and districts will expend two or three million dollars in road building this year. Owing to the conditions previously stated, most of the roads thus to be built will have no connection with each other.

During the past few years various localities have expended large sums in building local roads. Hillsboro County spent a million dollars. Duval County spent a million dollars. Dade County, Palm Beach County, Volusia County, St. Johns County, Pinellas County, Wanatee County and several others have spent considerable amounts. The only effort, however, towards the building of a continuous road, seems to have been that down the East Coast, from Jacksonville to Miami.

By reason of the localized sentiment, which is naturally transmitted to, and voiced by, members of the legislature, it has hitherto been impossible to secure good roads legislation of a state-wide character. The shape of the state, and the distances of some of its important localities from each other; the possibility of failure to get a fair share of benefits; the fear that power or authority would be withdrawn from county boards; the fear of increased taxation without immediate resulting local benefits, and a failure to "get together" on any particular measure, have so far prevented the members of the Legislature from enacting a comprehensive good roads law. At the legislative session of 1913, a measure passed the Senate, and was lost by a tie vote in the lower house. In 1911 a similar measure was lost by a very small majority.

During the past winter, the writer and the Secretary of the Florida State Good Roads Association have conducted a campaign, under the auspices of that organization, for the establishment of a state highway department. The campaign consisted of newspaper articles, supplied regularly to all the newspapers of the state, and a number of public meetings and addresses in different localities. A good roads train, with an exhibit of road materials and machinery prepared by the U. S. Office of Public Roads was arranged for, but had to be abandoned because of lack of funds.

The object of this campaign of publicity was to bring about, if possible, a wider perspective on the part of the people of the different counties and communities, so that the fact of their segregation might be made into an incentive for reasonable legislation, rather than, as in the past, acting as a bar against it. With a harmonizing and unifying of the dominant good roads sentiment of the state, legislation at the coming session is practically certain.

State aid, in money, will hardly carry in the approaching legislature, according to the best obtainable informaiton. If such a measure shall be introduced at all, it will probably be for the purpose of being defeated, in the hope that a bill which may be satisfactory in other respects may be aided by the defeat. One mortal fear which seems to possess the souls of most legislators is that of an increase in the tax rate; and no action is likely which will require an appropriation of funds large enough to cause such an increase. For the past two years the state tax rate has been 5.5 mills, which the taxpayers seem to think is amply large.

But a measure creating a state highway department is likely to be enacted. The Legislature will meet on April 6, and various measures are likely to be presented. Their fate depends to a considerable extent on the organization of the House of Representatives.

Probably the measure most likely to be enacted will provide for a commission of five members, one from each of the four congressional districts of the state, with the governor as chairman; the commission to employ a competent state highway engineer who shall also be secretary of the commission, and be in charge of the state highway department. The duties of the state highway engineer will include giving advice and information, on invitation, to boards of county commissioners, preparing surveys, specifications, making inspection and tests of materials and other similar work. It is also possible that a moderate sum of money may be placed at the disposal of the department for emergency purposes, to enable the state to take the initiative in making at least temporary improvements on short stretches connecting larger systems, when other means are unavailable.

The question of convict labor on the highways is certain to attract much attention. There are now approximately 1,100 state convicts available for highway work under existing laws, and as many more will become available during the next two years as present leases for their employment expire. The present law, however, provides that counties or road districts employing state convicts on the roads shall pay $10 per month per prisoner to the state for each convict's services, in addition to the cost of maintenance, guarding and transportation. Under the labor conditions that of late have been obtained in Florida, the aggregate expense has reached so nearly the amount which free labor would cost that but few counties have availed themselves of the opportunity. There are probably a half dozen convict camps at work on the highways in different sections of the state.

There is a growing sentiment that the present law providing for the payment of the $10 a month should be eliminated. Under the system of leasing convicts the state derived that amount of profit, and in doing away with the leasing system it was considered that the change should be gradual, and, at its inception, without financial loss to the state. At this time many people are arguing that it is ethically and morally wrong for the state to make a profit on the labor of its unfortunates and are claiming that the only logical labor which convicts can perform is in connection with such public work as the state cannot afford to have performed otherwise —preferably in building highways.

Florida presents many phases which are paradoxical when compared with standards of construction and the uses of materials as employed in northern states. The soil, over most of the area of the peninsula, is a very fine sand, most of which will go through a 100-mesh sieve. On the surface this is mixed with more or less decayed vegetation and ash. Dade County, in the extreme southeast, has a profusion of soft limestone, which is much used in that and adjacent counties. This stone crushes easily, and cements thoroughly, but it wears into dust very rapidly. After many experiments with surfacings, a large mileage of these roads is now being given a surface treatment of asphalt and sand. This adheres well to the surface, and appears to have solved the problem of an economical wearing surface with the Dade County rock as a foundation.

There is a belt of flinty limestone which crosses, or is found in parts of Hernando, Citrus, Levy and Marion Counties. Much of the flint occurs in various sized bowlders imbedded in a soft limestone. There is also an exceedingly fine grained limestone with soft outcropping but fairly hard after getting well into the ledge, which is found near Crystal Spring, in Citrus County. Stone is available in various sections, and all of it can be utilized for road foundations, and a proper study by competent engineers may make it available for surfacing material. Comparatively little of this stone has as yet been used, presumably owing to the lack of detailed and technical knowledge of its real value, on the part of the local authorities.

A "sand-asphalt" construction is being used in several localities in Florida, especially along the western side of the peninsula and in the interior. In this construction the sand foundation is wet, and rolled down hard with a heavy roller. This sand compacts firmly when saturated. Then sand and asphalt are heated, mixed in the proportion of 86 to 90 parts of sand to 14 to 10 parts of asphalt, and then spread and rolled, much as sheet asphalt is placed, to a depth of 2 or 3 ins., according to the anticipated traffic. Similar methods are being employed in some sections on the eastern side of the peninsula. These latter are mostly private propositions, opening up areas of land to settlement.

Among the roads in Florida which may be said to be "improved," a considerable proportion is constructed of shell. Most of these shell roads were built by merely leveling the sand subgrade and putting on 8 or 10 ins. of shell, leaving the compacting to the traffic. Where modern methods are employed and the material well compacted, the road is much better and remains in good condition longer; but it is subject to the same disadvantage as the Dade County stone. It wears into dust easily, which makes the maintenance expensive. Like a macadam road, however, it makes a good foundation for surfacing when properly scarified and smoothed to the proper grade and crown.

Several million dollars have been spent in various counties on brick roads, and in some counties the bonds have been voted with the understanding that brick was to be used. In brick construction, as practiced in Florida, the sand subgrade is rolled, and the brick blocks laid flat on the foundation thus provided. In the more modern construction concrete curbs, built in sections about 5 ft. long, are set 18 or 20 ins. deep and flush with the surface of the brick. No filler is used, sand being swept into the spaces between the bricks. As a result the storm water from the torrential rains which are frequent at some seasons of the year, drive or seep through into the subgrade and gradually disintegrate the compacted sand. Then the road becomes "wavy" and in two or three years the brick has to be taken up, the foundation reconstructed and the brick relaid, at an expense equal to about 30 to 35 per cent. of the original cost. Outside of a few localities these brick roads are built 9 ft. wide. They cost approximately $1,000 per mile per foot of width.

In the larger cities and towns in Florida there are the same standard pavements that exist in the cities of other sections of the country. In Jacksonville are long stretches of asphaltic concrete and sheet asphalt, as well as asphalt block, concrete, and brick laid on concrete foundations. Older pavements of brick without foundation other than sand are generally in bad condition.

Probably another function of the state highway engineer, when the Legislature shall have created a department of highways, will be to study the conditions and material resources of the state, and prepare an outline for a system of state highways to be submitted for future legislative consideration.

Florida really needs a system of state highways to connect its various segregated communities. A vast revenue is derived from winter visitors, which will be multiplied by such a system; and vast areas of land will be opened up to settlement and cultivation. And the state has no debt.

Porsgress on State Highway Work in California

According to a recent statement furnished by State Highway Engineer Austin B. Fletcher of California, the work on the state highways up to January 15 of this year included the making of surveys on 2,150 miles of road; the making of layouts on 1,101 miles; the completion and acceptance of work on 382 miles, and the completion of other work which had not been accepted at the date of the report on 250 miles. At the date of the report, there were contracts let including work to be done by day labor for 1,008.5 miles of road. The details of work completed or under contract at the date of the report are shown in the following table:

Character of Work.	Miles.
Graded only	270.1
Water bound macadam	12.9
Oil macadam	19.1
Cement concrete (thin bituminous top)	664.3
Macadam (asphaltic top)	16.5
Cement concrete (asphaltic top)	20.9
Timber and concrete trestle	4.4
Bituminous concrete	0.3
Total	1,008.5

The construction work in the year 1914 comprised the work shown in the following table compiled by the State Highway Department:

Pavement Laid (minimum thickness, 4 ins.):		
Portland cement concrete:		
12 ft.	6 miles	
15 ft.	208 "	
18 ft.	43 "	
20 ft.	8 "	
24 ft.	5 "	
Total		270 miles
Macadam:		
Water bound	4 miles	
Oil bound	3 "	
Total		7 "
Graded roads	142 miles	
Total		142 "
Total construction		419 miles
Surfacing:		
Thin bituminous		85 miles
Asphalt		21 "

Another table shows the amount of cement purchased by the department in each of the last three years. In 1912 the amount was 132,955 bbls., in 1913, 190,622 bbls., and in 1914, 572,066 bbls., making a total of 895,643 bbls.

An Appropriation of $30,000 for Road Work has been made in Shelby County, Kentucky. In addition to this sum there will be available $12,000 in state aid.

Wearing Surfaces*

BY GEO. W. TILLSON†

The question of improved roads first became important when the transportation of commodities and passengers by wheeled vehicles came into vogue. This was in comparatively recent times, as the world's history goes, for as late as one hundred years after the reign of Queen Elizabeth regular pack trains for the transportation of goods were operated in England, and even at that time wheeled vehicles for passengers were very little used. Writers tell us that in the seventeenth century the nobles, in traveling from their homes to London in private carriages, were often robbed by highwaymen, so frequently indeed that a highwayman, when convicted, was punished with death. It is also stated that the bad condition of the roads aided the highwaymen very materially in making their hold-ups.

Ever since that time there has been much discussion regarding road construction, but it was not until 1764, when M. Tresaguet, in France, began to build broken stone roads of somewhat the same character as are now well known in America by the name of macadam, that much improvement was noted; and it was about sixty years after this that systematic road building was begun in England, under the direction of Telford and McAdam, from which latter name has come the term in general use for macadam broken stone roads.

It would seem, too, that road construction in those days received more attention than pavement construction in cities, as it is stated that an English engineer in 1826 publicly remarked that "however true it may be that an observant traveler cannot fail of being struck with admiration at the excellence of the turnpikes and other roads throughout this country, he must at the same time be very much surprised at the badness of the carriage pavements, even of the principal streets of the metropolis."

The importance of road building in this country has been known for many years, but it did not receive much attention until about 1895, when the advent of the bicycle and its great popularity for a time made necessary the construction of improved roads if the bicycle were to be used to its best advantage.

When the use of the bicycle began to wane, the development of the automobile caused the subject to be taken up anew, and with increased vigor. The people using the automobile were much more influential and wealthy than those using the bicycle, and the result has been that a wonderful good roads movement has been extended all over the country. It has grown to such an extent that in the state of New York alone during the past six or eight years issues of bonds to the amount of $100,000,000 have been authorized, and the greater part of this amount has been spent to date.

J. C. Pennybacker, Chief of Road Economics, United States office of Public Roads, in an article in the "Engineering Record" of January 3, 1915, states that 16,000 miles of surfaced roads were constructed in the United States during 1913, and 18,000 miles during 1914, or a total of 34,000 miles in the brief period of two years. He estimates that the total outlay for 1914 for good roads was $225,000,000, while in 1904 the total expenditure in all states slightly exceeded $79,000,000. This $225,000,000 represents an expenditure of $2.25 per capita for the entire United States, being about $20,000,000 for New York State alone for one year.

These figures are enormous, and one has to wonder if the work can be kept up, and also if, with this enormous amount of road building, sufficient provision, both in organization and in money, will be provided for proper maintenance.

Kinds of Roads

Earth Roads.—The cheapest form of road, of course, is the ordinary graded road, without any attempt to surface with any foreign material. Although this cannot be considered an improved road, still with proper attention to it, results can be obtained that seem remarkable when compared with an earth road that receives no care at all. By the use of road drags and a little attention during bad weather, earth roads can be kept in fairly good condition for ordinary traffic.

Sand-Clay Roads.—These roads are made either by the application of clay to the ordinary sand surface or the application of sand to a clay surface, according to the original condition of the road to be improved. In proportioning sand and clay in this method of construction it must be understood that the clay acts practically as does cement in cement mortar, and consequently an amount of clay sufficient to fill the voids only should be used. This is more important than in the case of mortar, because if too large an amount of clay is used it will allow the particles of sand to move too freely, while if the amount is too small the particles of sand will not be bound together.

It must be understood, too, in this general treatment, that the quantity of sand to be used depends upon the character of both the sand and clay, a clean, sharp sand requiring more clay than one which has a certain amount of loam, and, too, the quality of the clay is an important factor, whether it is pure or whether it has an admixture of sand.

When a clay road is to be treated, the surface should be brought approximately to the form that is desired and loosened up, when the sand should be spread over the surface in sufficient quantities and thoroughly mixed. The surface should then be smoothed off and compacted with a light roller or road drag.

When the original soil is sand, the road is leveled off and the clay spread upon it to the required width and thoroughly mixed with the sand, when the roadbed is shaped up, and, if necessary, more sand applied. The surface is then smoothed and compacted as for the clay subsoil.

Gravel Roads.—Very satisfactory and fairly durable roads can be made with gravel, the exact method of construction depending upon the quality of the gravel itself. But in the main, it is spread over the road to such a depth as to give proper thickness when completed and then rolled until it becomes hard and firm. Whether it will require any filling or binding in order to make the surface hard and compact depends upon the quality of the gravel. It can be said, however, that the softer the gravel, the more easily it will be compacted, but, for the same reason, it is less durable under traffic. These roads are often used in parks, and even on state roads where the traffic is light and where a permanent material is expensive. It is difficult to give an estimate of their cost, as this depends entirely upon the distances the gravel must be brought, and its first cost. An estimate of 50 or 60 cts. per sq. yd. would probably be not far from correct for a gravel road 6 ins. deep.

Water Bound Macadam.—This is the well known broken stone road surface, which is made up of different layers of broken stone, the surface layer being about 3 ins. thick and formed of stone that will pass through a 2-in. ring, the character of the stone depending a great deal, as in gravel, upon its binding easily. As a rule, limestones are of such a character that sometimes no rolling is required to obtain a smooth and hard surface, while trap rock, on the contrary, must have the interstices filled with fine material in order to get the stone sufficiently bound together. Water bound macadam was laid in New York State in 1914 at a cost of 30 to 40 cts. per sq. yd. for a wearing surface 3 ins. thick.

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*Paper presented at the Second Canadian and International Good Roads Convention, Toronto, Ont., Can., March 22-26, 1915.

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Bituminous Roads.—When the automobile, with its pneumatic tires, came into use, it was found that it presented an entirely different problem from the old horse-drawn vehicle with its steel tires. The former caused the macadam to disintegrate and ravel, while the latter had a tendency to compact it in a manner somewhat similar to steam rollers. This fact was recognized first in Europe, because the automobile was used there to a considerable extent previous to its use in America, and different methods of treatment were instituted to overcome the bad effect. The first method was to spray the surface with tar, and after many experiments, schemes were worked out that were fairly satisfactory. This method has been employed to quite an extent in America, but, with surface treatments, asphaltic oils are generally used, as they are cheaper and, some engineers think, better. The volatile parts of these oils evaporate upon exposure, leaving an asphaltic carpet over the surface which is much like an asphalt in its general appearance.

In Brooklyn, New York, nearly all of the park roads are of gravel, and a great portion of them have been treated as follows: Heavy asphaltic oil is spread on the surface at the rate of .7 gal. per sq. yd. The ruts and holes in the road are all repaired previous to the application of the oil. The oil is applied by gravity distributors, it being taken from tank cars, which are heated to a temperature of about 200° F. before being unloaded. The oil is maintained in the distributor at this temperature and applied to the roadway surface. After the oil has been applied, a coating of coarse sand is spread at such a rate that 1 cu. yd. of sand covers 53 sq. yds. of surface. The roadway is closed to traffic for 24 hours after the spreading of the sand.

This process has been in use for two or three years and has given good results. It must be remembered, of course, that on the park roads no heavy vehicles are allowed, and it is undoubtedly true that with heavy steel-tired vehicles this treatment would not be satisfactory. Some trouble, even with the automobile traffic, occurs, in the shape of creeping and bunching of the surface, but the bunches are cut out and easily repaired.

The cost of the asphaltic oil delivered in cars is 6 cts. per gal., the cost of sand alongside the road, $1.35 per cu. yd., and the cost of the complete treatment, including labor and materials, but not including overhead charges, has averaged 8 cts. per sq. yd., for three years.

Another method of building bituminous roads is what is known as the penetration method, when, after the stone is spread upon the road, the upper surface is sprinkled with the bituminous material, whether tar or asphalt, and then rolled and completed with certain surface treatments. In New York State during the past year this treatment has cost from 50 to 60 cts. per sq. yd. for a wearing surface 3 ins. thick.

In Massachusetts, by the penetration method, using 2¼ gals. per sq. yd. of Bermudez asphalt, 2 ins. thick, the cost has been 66 to 80 cts. per sq. yd.

In Massachusetts, too, in 1914, there was used a surface composed of oil, asphalt and gravel, using 18 gals. of asphalt per cu. yd. of gravel, and spread so as to have a thickness of 2 ins. after rolling, at a cost of 30 to 35 cts. per sq. yd., while with oil, asphalt and sand, mixed and spread to a depth of 4 ins., after rolling, the cost was 54 to 60 cts. per sq. yd. Using the penetration method with tar instead of asphalt, with 2¼ gals. per sq, yd. of surface, 2 ins. thick after rolling, the cost was 45 to 65 cts. per sq. yd. It must be understood, of course, that these costs will vary, as in some cases gravel was used which cost 80 cts. per cu. yd., while in others trap rock was used, which cost $2.50 per ton, which is considerably more than the cost of gravel per cubic yard.

There are many other methods of using bituminous wearing surfaces. One of these is known as the Topeka mixture, as it was first used in Topeka, Kansas, and has been decided by the courts not to be an infringement on any patents. It is laid much as is sheet asphalt pavement, but with a larger aggregate. In 1912 over one hundred miles of roads were surfaced in the Borough of Queens, New York, with practically this kind of pavement. The specifications for the wearing surface for this work read as follows:

> The finished pavement shall contain between 7 per cent. and 11 per cent. of bitumen soluble in carbon disulphide, depending upon its mesh composition, but in all cases sufficient asphalt cement shall be used to thoroughly coat all of the particles of the mineral aggregate.
>
> Mineral aggregate shall be proportioned as follows:
>
> Mineral aggregate passing 200-mesh screen, from 5 to 11 per cent.
>
> Mineral aggregate passing 40-mesh screen, from 18 to 30 per cent.
>
> Mineral aggregate passing 10-mesh screen, from 25 to 55 per cent.
>
> Mineral aggregate passing 4-mesh screen, from 8 to 22 per cent.
>
> Mineral aggregate passing 2-mesh screen, less than 10 per cent.
>
> Screens to be used in the order named.

Roads of this character were laid in New York State in 1914 by the State Highway Department, at a cost of 85 to 95 cts. per sq. yd.

During 1914 some twenty-five or thirty miles of bituminous roads were built at the Ashokan Reservoir of the new water supply system for New York City. The wearing course was formed of stone passing over a ½-in. screen and through a 1½-in. screen. By an adjustment of the jackets on the screens a sufficiently graduated stone was obtained to produce proper results. The broken stone was heated and mixed, in a machine similar to one used for sheet asphalt, with an asphaltic cement so that the resulting mixture should contain between 5 and 7½ per cent. by weight of bitumen. The mixture was spread upon the road and thoroughly rolled, when a seal coat of hot asphaltic cement was spread over the same, by a proper appliance, and then smoothed off with squeegees. The asphaltic cement was applied on the average at the rate of a little less than 1 gal. per sq. yd. Upon this squeegeed coat stone chips were placed, which were thoroughly rolled into the surface, any lack of chips being supplied by a second distribution. The wearing surface 2 ins. thick cost $1.01 per sq. yd., native stone being used.

It would be difficult, and perhaps unnecessary, to go into a detailed description of the many kinds of bituminous roads. Those herein described give a fair idea of what are in ordinary use.

Concrete Roads.—During the last five or six years quite a large amount of roads have been constructed having a wearing surface of cement concrete. It was thought at first that this would not give satisfactory results, as it was feared that the concrete would be so affected by the changes in temperature as to crack in cold weather or bulge in warm weather; also that it would be difficult to keep in repair.

Possibly the best and best known examples of concrete roads are located in Wayne County, Michigan, in the vicinity of Detroit. The writer had an opportunity of driving over these roads last summer, and he was very much surprised at their good condition. One in particular that was only 9 ft. wide and half a mile long had been in use five years, and had cost during the entire five years but $26.00 for repairs. It is true that on this section the traffic was not great, but on another road, where the pavement had also been laid five years, under quite heavy traffic, the concrete was still in good condition. The cost of these pavements varied according to conditions, as practically all of the material had to be brought from out of the state, and the cost of even the water was great, as many of the roads extended into the country long distances from any watermains. The concrete for these roads was generally laid to a depth of about 6 ins., and the cost on the average was about $1.35 per sq. yd.

On Michigan Avenue, however, the concrete was laid an average depth of 7 ins., mixed in the proportion of 1 part cement, 1½ parts of sand, and 3 parts of gravel. In this particular case the cost of the concrete was $1.47 per sq. yd.

In Massachusetts the cement concrete roads laid in 1914 were of an average depth of 7¼ ins., and cost from $1.40 to $1.55 per sq. yd., while in New York State, with a mixture of 1 part of cement, 1½ parts of sand and 3 parts of broken stone, averaging 6 ins. in thickness, they cost $1.00 per sq. yd.

Concrete roads are sometimes covered with a thin coat of bitumen, the idea being to prevent the wear of the concrete and get a more resilient and a less noisy road. There has been some difficulty in making the bitumen adhere to the concrete. The practice of using the bitumen has not yet become general.

Brick Roads.—In the Central West, where paving brick is cheap and good, a great many brick roads have been laid. This is especially true of Ohio, and particularly around Cleveland. The writer in 1914 made an examination of many of these roads; while some of them showed defects, probably due to lack of drainage, as a whole they were in extremely good condition and must be a great boon to the farmers and other people living in the vicinity of Cleveland. It happened that the time the inspection was made was soon after a rain, when the clay of that country was in exceedingly wet and sticky condition, so that, when sometimes it became necessary to take an unimproved road to get from one brick road to another, the value and convenience of the brick roads were especially appreciated. These roads are expensive, as all of the material has to be transported for quite a distance, and much of it by horse-drawn or motor vehicles, as the roads are sometimes quite a distance from the railroads. The cost in Ohio for brick on concrete averages about $1.80 per sq. yd.

In New York State, in 1914, brick cost $1.55 per sq. yd.

It sometimes happens that, on account of the heavy traffic in the vicinity of cities, roads are constructed that are practically street pavements. In New York State, in the eastern district, some asphalt block pavement was laid in 1914 at a cost of $1.40 per sq. yd.

It does not seem necessary or pertinent at this time to go into the merits or descriptions of the different kinds of road pavements, as that would mean an extended discussion.

Type of Road to be Selected

Which one of the foregoing methods of improved road construction is to be used depends upon several conditions. The first of these is the ability of the county or state to pay for the work, and then there must be considered the amount of traffic which will use the road, and its character. There is absolutely no use to plan a road, no matter how well adapted it is to conditions, if there are no funds to pay for it. With a limited amount of money the problem is to obtain results with that money, and in order to do this a complete investigation must be made of both the amount and character of traffic, because if the road is to be used by heavy vehicles, a different form of construction is required from what would be called for if the same tonnage were to be drawn over the road in smaller loads. It is possible that heavy loads may be so infrequent that they can be left out of consideration entirely, but if considered, upon their frequency will depend the treatment that should be given to the road.

If, however, funds are available to build the best road, from an economic standpoint, the problem is somewhat different, as the matter of first cost is not so important as ultimate cost. In considering the ultimate cost and assuming that the roads are built out of the proceeds of a bond issue, as they are in New York State, the expense is not the first cost, but the interest on the first cost, the cost of repairs, and the amount of money to be paid in each year for a sinking fund that will pay off the bonds when they become due. And in this connection it should be said that in any bond issue made for a road improvement, or for any other improvement, the term of years for which the bonds are issued should be equal to the life of the improvement as nearly as it can be estimated.

It is also necessary that the deciding official should understand fully the properties of each one of the different roads so that he will know the ability of each one to sustain the traffic that he finds will be applied to it when constructed. He must understand, too, that a road when improved is likely to attract traffic, and that as a general rule the traffic will be much greater after a road is improved than before.

Having determined the type of road to be used, the exact material must be determined. This is an engineering proposition, and the availability of the material must govern the choice to a great extent. Trap rock, for instance, might work out as the most economical from a general standpoint, but might be prohibitive on account of the cost of transportation. It often happens that a less valuable material will prove more economical, on account of its propinquity to the road, than a better material which must be transported some distance.

In this consideration it must be understood that there is a natural as well as a traffic life to road material, that is, gravel, stone or brick will have a life according to the traffic as they are not acted upon by atmospheric conditions, while, on the other hand, asphalt, coal tar, or other bitumens are acted upon directly by the atmosphere, and, even without traffic have a certain life.

A careful study must be made as to all of these conditions, the first cost and the cost of repairs of the different kinds of wearing surfaces, together with their characteristics, as well as the availability of the different materials. With all these items before him, an official can determine pretty accurately which is the best surface to be used.

Highway Work in Negaunee, Mich., during 1914 cost $17,538.46, according to the annual report of the Street and Highway Department of that place.

The Total Expenditure of the Street and Bridge Department of the City of Houston, Tex., during the past fiscal year amounted to $190,222.25, according to a recent report of Street and Bridge Commissioner Drennan. During the year the department paved 154 blocks, of which 29½ blocks were paved with new gravel, 89½ blocks with old gravel and 35 blocks with old shell.

Street Work in St. Joseph, Mo., during the coming year, according to present plans, will include the paving of 111 blocks at a total cost of $222,000. Of this total, $85,500 worth of work is to be undertaken shortly. This includes asphaltic pavements to the amount of $32,100, vitrified brick to the amount of $7,000, concrete to the amount of $40,750 and macadam, with tar treatment, to the amount of $5,650.

The Advantages of Oiling City Streets are strikingly illustrated by a recent statement relative to the saving effected in the cost of sprinkling, repairing and cleaning streets in the city of Oakland, Cal. During the year 1910-11, the cost of sprinkling, according to the statement referred to, amounted to $86,613. The corresponding expenditure during the season 1911-12 was $81,466; during 1912-13 it was $67,858, and during 1913-14, $56,492; while the estimated cost for the season 1914-15 was placed at $45,615. In discussing these figures, it was stated that the fiscal year 1910-11 included a wet winter when the rainfall was particularly heavy and that, in addition, during May and June, 1911, certain retrenchments had to be made on account of lack of funds, so that the total expenditure for sprinkling was less than might reasonably have been expected. On the other hand, the years of 1911-12 and 1912-13 were extremely dry, and had no oiling been done the annual cost of sprinkling might well have been nearly $100,000. Attention was also called to the fact that the area sprinkled in 1910-11 was smaller than the present area sprinkled. Since July 1, 1911, the Street Department has oiled over 90 miles of macadam roads, and to this is attributed the reduction in the cost of sprinkling as well as very material savings in the costs of repairing and cleaning.

Reorganization of the U. S. Office of Public Roads

Certain changes in the organization of the Office of Public Roads of the U. S. Department of Agriculture were made by the Congress which has just ended through the bill making appropriations for the Department of Agriculture for the fiscal year ending June 30, 1916. It is understood that the changes made in the organization of the office were designed to place in one organization all the engineering work of the Department.

The Office of Public Roads at present comprises a division of construction, having charge of experimental, post road and object lesson road construction, and general advisory engineering work relating to road building; a division of maintenance, having charge of experimental and demonstration maintenance work, and advisory work concerning road maintenance; a division of national park and forest roads, having charge of such phases of the construction and administration of national park and forest roads as have been intrusted to it under arrangements made with the Department of the Interior and the Forest Service of the Department of Agriculture; a physical testing laboratory, for making routine tests of road materials, and similar work; a chemical and petrographic laboratory, having charge of routine analyses, research investigations concerning road binders and other work, and a division of economics, having supervision over all statistical and legislative work, lectures, efficiency studies of convict labor and the like. To these will be added a division of irrigation investigations, a division of drainage, investigations, and miscellaneous work relating to farm buildings and machinery, farm water works and the like, which have previously been conducted by other bureaus of the Department of Agriculture.

The Office of Public Roads and Rural Engineering, as it is designated in the appropriations bill previously referred to, is given a total appropriation of $586,465. Of this amount, $75,960 is for salaries and the remainder, $510,505, is divided as follows:

For inquiries in regard to systems of road management throughout the United States and for giving expert advice on this subject, $42,600;

For investigation of the best methods of road making, especially ordinary sand-clay and dirt roads, and the best kinds of road making materials, and for furnishing expert advice on road building and maintenance, $145,000;

For investigations of the chemical and physical character of road materials, $34,820;

For conducting field experiments and various methods of road construction and maintenance, and investigations concerning various road materials and preparations; for investigating and developing equipment intended for the preparation and application of bituminous and other binders; for the purchase of materials and equipment; for the employment of assistants and labor; for the erection of buildings; such experimental work to be confined as nearly as possible to one point during the fiscal year, $60,000;

For investigating and reporting upon the utilization of water in farm irrigation, including the best methods to apply in practice; the different kinds of power and appliances, and the development of equipment for farm irrigation; the flow of water in ditches, pipes, and other conduits; the duty, apportionment, and measurement of irrigation water; the customs, regulations, and laws affecting irrigation; for the purchase and installation of equipment for experimental purposes; for the giving of expert advice and assistance; for the preparation and illustration of reports and bulletins on irrigation; for the employment of assistants and labor in the city of Washington and elsewhere; for rent outside of the District of Columbia; and for supplies and all necessary expenses, $106,400;

For investigating and reporting upon farm drainage and upon the drainage of swamp and other wet lands which may be made available for agricultural purposes; for preparing plans for the removal of surplus water by drainage, and for giving expert assistance by advice or otherwise in the drainage of such lands; for conducting field experiments and investigations concerning the construction and maintenance of farm drainage work; for investigating and developing equipment intended for the construction and maintenance of farm drainage structures; for the purchase of materials and equipment; and for preparing and illustrating reports and bulletins on drainage; and for the employment of assistants and labor in the city of Washington and elsewhere; for rent outside the District of Columbia, and for supplies and all necessary expenses, $96,280.

For investigating farm domestic water supply and drainage disposal, the construction of farm buildings, and other rural engineering problems involving mechanical principles, including the employment of labor in the city of Washington and elsewhere, supplies, and all other necessary expenses, $12,805.

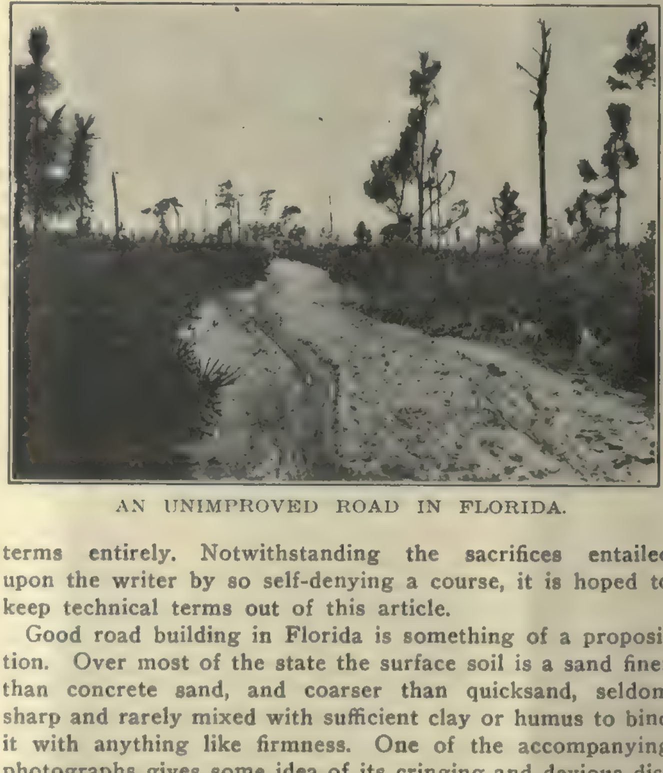
For general administrative expenses connected with the above mentioned lines of investigations and experiments, $12,600.

It is understood that while the exact nature and extent of the reorganization of the forces of the Office in order to carry on the additional work can not as yet be stated, the plan of organization now in force will be followed as far as practicable in the larger organization.

Impressions of Florida Roads

BY A LAYMAN

Everybody knows that the lay writer is never at a loss for technical terms when discoursing among experts—his only trouble is to make the experts understand him. This difficulty might be overcome by a glossary, showing what he meant by the terms he employed; or by cutting out the terms entirely. Notwithstanding the sacrifices entailed upon the writer by so self-denying a course, it is hoped to keep technical terms out of this article.


AN UNIMPROVED ROAD IN FLORIDA.

Good road building in Florida is something of a proposition. Over most of the state the surface soil is a sand finer than concrete sand, and coarser than quicksand, seldom sharp and rarely mixed with sufficient clay or humus to bind it with anything like firmness. One of the accompanying photographs gives some idea of its cringing and devious disposition. No automobile has any business or pleasure in such going, especially if it is a very heavy machine or of the northern gauge; but the Fords twist gayly along in high gear all over the state in a truly amazing manner—and this statement brings no share of Henry's profits either.

Journeying about in one of Ford's machines and looking over the landscape casually one would say offhand that there was no road building material in the state, but in reality there is a good deal. Along the beaches lie shells in heavy layers; limestone, the foundation of the state, crops to the surface in the hardwood hammocks; while screenings composed of lime rock and fossil bone exist in heaps as a byproduct of the phosphate mines. Lastly there is clay, but in the peninsular part of the state at any rate this material is not common. One other surfacing substance, in part native, is sand-asphalt; and brick can, of course, be obtained.

LIMESTONE QUARRY IN A FLORIDA HARDWOOD HAMMOCK.

Florida's problem lies in the proper utilization of these materials.

Thirty-five years ago there existed hardly a foot of surfaced road south of Jacksonville. At that time the streets of Tampa lay deep in sand, and the festive razor-back roamed its board sidewalks. Today Tampa is a city of sixty thousand inhabitants, as modern as its age implies, and boasts probably 100 miles of brick pavement within its greater limits.

A road building fever seems to be attacking the state in all its parts. Practically every county is in the process of spending from $250,000 to $500,000 on its roads, in addition to amounts previously spent—not a bad showing for a section less than 50 years ago mainly an uninhabited pine forest.

Looking upon Florida as a frontier country the results so far achieved in road building are not entirely discouraging, yet with the exception of very expensive brick paving there was up to a year ago almost no really good cross-country road in the peninsula. Shell roads, terrible on automobile tires when first laid, later became ideal, only to develop potholes shortly thereafter, which, as there was no maintenance system worthy the name, became steadily deeper and more numerous until in places the surface resembled a succession of kettle rims.

The limestone used in the roads was quarried in hammocks similar to that shown in one of the accompanying illustrations. It often, or usually, varied in hardness, was laid too thin, without sufficient care as to the subgrade, and with little or no gradation of size in the successive layers. Most of these roads are now, and always were, horribly rough.

LAYING SAND-ASPHALT PAVEMENT IN FLORIDA.

There is, however, in some few localities, a rock very much softer than limestone—so soft that it can be cut with a knife—which, having been put on the road in lumps soon levels down to a fine, smooth surface. At Hudson there is such a road, laid and rolled by hand years ago by the logging crews of a sawmill concern, and this today is about the best piece of road on the West Coast.

It is the lay writer's opinion that phosphate screenings properly applied would make a better road than straight shell or limestone, but he knows of no considerable stretch of such road.

Florida is by no means the dead level a first glance indicates. Except in the flat woods no level road is to be found. None of the grades are long, and none are steep; but they are everywhere. Lakes are very numerous, also tidal indentations, besides which there are some swamps. In certain low spots in West Tampa are to be seen stretches of brick road so little elevated as to be covered with water most of the time. In general, throughout the state, the tendency has been not to get the roads up enough in wet places, and to pay too little attention to grade.

This may sound lugubrious, but be of good cheer, Pasco County now boasts a long piece of highway built of limestone laid on a fairly prepared foundation, sized, and bonded —I think this is the word—bonded on top with Lake Asphalt. And it certainly looks good; extra good, to all who have seen it. The north end of this road is not asphalted, and, although entirely similar and practically new, already shows the beginnings of ruts and depressions.

BITUMINOUS ROADWAY IN PASCO COUNTY, FLORIDA.

At Tarpon Springs hot mixed sand-asphalt road is being laid on residence streets with a Cummer plant, using Texaco; and this road, which would be much cheaper than brick for cross-country work, looks very promising. Sand-asphalt has not had a fair test by time, temperature, and the elements anywhere in the state as yet; and this experiment will be watched very closely by many communities and counties.

By and large, the solution of the road question in Florida's country districts seems to lie in the use of native material and a bituminous binder. With such a binder limestone gives promise of longevity, though in itself an inferior material. So bonded even the sand along the way bids fair to become of use.

These facts and the greater care now used in preparing the road foundation as to grade and drainage encourage the belief that Florida is working out of the pioneer or experimental stage into an era of really satisfactory road building. Unless all signs fail there should be within two years one or two good hard surfaced trunk roads from Jacksonville to Tampa, to which will be joined a great number of branch roads already laid or in process of construction.

Wood Block Paving in Peoria, Illinois[*]

BY L. D. JEFFRIES[†]

The city of Peoria, Illinois, has at present writing approximately 31,500 sq. yds. of wood block paving, the first of which was laid in the year of 1910.

The street was paved rather late in the fall and freezing temperatures were encountered before the work was completed. In this work, 3½x3¼x8-in. blocks were laid upon a 1½-in. sand cushion under which was a 6-in. concrete foundation. The blocks were laid diagonally across the street at an angle of 60 degrees with the center line. Longitudinal expansion joints of pitch were placed along the curbs and transverse joints 1½ ins. in thickness placed every 50 ft. The creosote or preservative oil had a specific gravity of 1.10 at a temperature of 25° C. and the blocks received a treatment of 20 lbs. per cu. ft. The blocks were laid very tightly together—in fact, were driven together by a flat iron bar—and no expansion was provided for along the street railway tracks. The pitch filler used upon the surface of the blocks was of an inferior quality (which was discovered later on) and this fact, together with the lateness of the season, caused the street to become a sea of tar during the following summer. The pitch became cold before it had penetrated into the interstices of the blocks and therefore an excess amount was left upon the surface.

Each succeeding year the amount of creosote oil preservative has been reduced and we are now using a 16-lb. treatment. The specific gravity of the oil now used is 1.08 to 1.10 at a temperature of 38° C. It has been our experience that a 16-lb. treatment of creosote oil of the above density is sufficient to protect the block from decay throughout the life of the pavement, as against abrasion, provided the timber and oil are of the grade herein specified, and a foundation and method of laying, including proper expansion joints, are in accordance with good engineering practice. The blocks should be laid loosely and not driven together.

A block subjected to a 16-lb. treatment, when split with the grain will not show a uniform impregnation throughout its section, especially in seasoned timber, as the heartwood is dense and fine grained, and the wood cells are largely filled with nature's own resin, which can not be removed through seasoning. Sapwood, on the other hand, through the annular growth of the timber to heartwood, is more open. The cells carry a more liquid sap, most of which is removed in the process of seasoning, leaving the wood cells in condition to receive the preserving oil. The sapwood will naturally appear very black, while the heartwood will appear very light, and in some cases will still show the natural color. The wood which needs the preservation has taken up all the oil it needs to properly preserve it, while the wood which needs none, i. e., the heartwood, has received a relatively small amount. The color of the wood, the blackness, is by no means a true index of the penetration of creosote oil, as the part of the oil which is the preservative, is of a light yellowish color, while the dense black gummy constituent constitutes the waterproofing element only. I might add that the material used for preservation, i. e., creosote oil, is obtained from the distillation of coal tar. Bituminous coal, geologically speaking, is no more or less than wood subjected to tremendous temperatures and pressures through early geological eras.

The creosote oil which we use today is nothing more or less than a chemical derivative of the resins of the heartwood which have been somewhat altered through the above named conditions of temperature and pressure. Were it possible to obtain paving blocks cut entirely from heartwood, or from the intermediate sapwood containing large amounts of resin, it would be useless to use any other preservative than that given the timber by nature.

I mention the above facts because of an experience that I had during the construction of a recent wood block pavement. Numerous curbstone critics had cut the blocks in two and finding that the blocks were black in some spots and white in others, naturally thought that the blocks did not contain the proper amount of preservative.

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[*] From a paper of the same title presented at the recent annual meeting of the Illinois Society of Engineers and Surveyors. [In addition to the matter here presented, the paper contains also the specifications used in Peoria.]

[†] City Engineer, Peoria, Ill.

Prizes for Solutions of the Problem of Relieving Traffic Congestion at New York Street Intersections

Three prizes—the first of $300, the second of $200 and the third of $100—have been offered by the Municipal Art Society of New York, N. Y., for the best three solutions of the problem of relieving traffic congestion at street intersections in New York City.

It is pointed out by the society that many American cities, having been laid out on the so-called gridiron plan, have developed certain badly congested thoroughfares, and in some instances where two such streets cross it becomes necessary to periodically stop traffic on one street in order to allow traffic on the other street to pass. It is stated that in some European cities it has been shown that by proper planning such congestion can be considerably relieved, and at the same time the cost of the necessary changes may be counterbalanced by the increased value of the abutting properties.

The problem presented is that of the crossing of two very important thoroughfares, one an avenue running approximately north and south and the other a street running approximately east and west. It is to be assumed that the two streets have widths, from building line to building line, of 100 ft.; that the lengths of the blocks on the avenue are 200 ft. 10 ins., from building line to building line; that the lengths of the blocks on the street west of the avenue are 920 ft. 0 ins. and east of the avenue 420 ft. 0 ins., from building line to building line; that traffic on the avenue is approximately twice as heavy as that on the street, and that the avenue has no surface car tracks but there is a double line of surface cars on the street.

The number of drawings a competitor may submit is limited to four and the size is not specified. Plans must be made on a scale of 1 in to 32 ft. and sections and elevations on a scale of 1 in. to 16. ft. The movement of traffic must be clearly indicated on the drawing. The drawings must be in line, either in ink or in pencil on white paper, and washes must be in black and white. They may be graded but without color. All drawings must be signed with a cipher and accompanied by a sealed envelope bearing the same cipher in which are enclosed the competitor's name and address. Only one design may be presented by each competitor and no descriptive memoranda are to accompany it.

The drawings must be delivered to the Municipal Art Society of New York, 119 East 19th St., between 9 a. m. and 5 p. m., Saturday, May 22, 1915. It is announced that they will be judged and awards made on Monday, May 24, by a jury composed of various city officials and others, or by their representatives. The drawings are afterwards to be exhibited in the galleries of the National Arts Club, 119 East 19th St., from Tuesday, May 25, to Saturday, May 29. The prize winning drawings are to become the property of the Municipal Art Society, the committee reserving the right to photograph or publish any of the drawings submitted.

The Committee on Prizes consists of Wm. N. Taylor, Chairman, Bert Hanson, Harry Allan Jacobs, Charles R. Lamb and Everett V. Meeks.

The County Supervisors of Tulare County, California, have decided upon the purchase of $475,000 worth of state highway bonds for the construction of a state road through that county.

AMERICAN ROAD BUILDERS' ASSOCIATION

150 NASSAU STREET
NEW YORK, N. Y.

President
GEO. W. TILLSON, Brooklyn, N. Y.

First Vice President
A. W. DEAN, Boston, Mass.

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A. B. FLETCHER, Sacramento, Cal.

Third Vice President
S. PERCY HOOKER, Concord, N. H.

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E. L. POWERS, New York, N. Y.

Treasurer
W. W. CROSBY, Baltimore, Md.

Through the courtesy of the publisher of "Good Roads," this page, each month, is devoted to the use of the American Road Builders' Association. It is solely in the interests of the Association, and it is the desire of the Executive Committee that all members feel that this space is their own, and that they contribute freely to it, not only as regards anything concerning the Association itself, but also that which will further the good roads movement. Besides the official announcements of the Association, there will appear on the page contributions by members, items of news concerning the Association activities and personal notes about its members. All contributions should be sent to the headquarters of the Association at 150 Nassau Street, New York, N. Y.

Executive Committee:
Geo. W. Tillson
R. A. Meeker
E. L. Powers

The Pan American Road Congress

The American Road Builders' Association and the American Highway Association will unite this year for the holding of one convention, designated as the Pan American Road Congress, as was noted in "Good Roads" for March 20.

The preliminary plans for the congress were made at a meeting in Montpelier, Vt., on March 18, when Governor Charles W. Gates, formerly State Highway Commissioner of Vermont, was elected the fifth member and chairman of the Joint Committee of the two associations. This committee, which has been at work since the latter part of last year, consists of Major W. W. Crosby, Consulting Engineer, Baltimore, Md., Treasurer of the A.R.B.A., and E. L. Powers, Editor, "Good Roads," and Secretary of the A.R.B.A., who were chosen by that organization; James H. MacDonald, formerly State Highway Commissioner of Connecticut, and J. E. Pennybacker, Chief, Division of Economics, U. S. Office of Public Roads, who were selected by the American Highway Association, and Governor Gates of Vermont, who is not identified with either of the associations and who was chosen as the fifth member by the other four members of the committee.

According to the preliminary plans made at the Montpelier meeting, the convention will be held at the Panama-Pacific International Exposition during the week of September 6, this date depending upon the making of satisfactory local arrangements. In the work the committee has already done it has found that great interest is taken in the coming meeting by those identified with highway improvement. It is expected that the meeting will bring together official representatives from every state in the Union, from Canadian provinces and many South American countries, and, in addition, the cooperation of other good roads organizations, the railroads and others is promised, so that a most successful convention already seems assured. Official invitations to appoint delegates will soon be sent to the governors of the several states.

In order to facilitate the work of the committee, which will have entire charge of the arrangements for the congress, its work has been apportioned among four subcommittees as follows: Finance, Mr. MacDonald; Program, Major Crosby; Publicity, Mr. Powers; Arrangements, Mr. Pennybacker.

The Association Dues

Members of the Association have noted that the bills for the 1915 dues are for three dollars instead of two. For the benefit of those who were not present at the annual meeting, the following explanation of this change is made:

For some time it has been felt that because of the increasing expenses of the Association and the fact that its dues have been less than those of similar organizations a slight increase should be made. This matter was considered by the Directors in February, 1914, was taken up again at the Chicago convention and was settled at the annual meeting last February by a vote of the Directors fixing the dues at $3.00 per year.

A. R. B. A. Notes

Dr. Joseph Hyde Pratt, State Geologist of North Carolina, is an ex-officio member of the newly appointed State Highway Commission of North Carolina, mention of which was made in "Good Roads" for March 27.

Joseph R. Thatcher, Director of the Board of Chosen Freeholders of Warren County, New Jersey, has been elected President of the State Association of Boards of Chosen Freeholders of New Jersey, which was formed at a recent meeting at Trenton.

George A. Ricker, formerly First Deputy Commissioner of Highways of New York, who was appointed Consulting Engineer to the commission, as noted in "Good Roads" for March 13, has now severed his connection with the department and has opened an office for private practice at 188 State St., Albany, N. Y. Mr. Ricker will engage in consulting on highway and other engineering work.

A meeting of the Board of Directors will be held at the office of Past President Nelson P. Lewis, Chief Engineer of the Board of Estimate and Apportionment of New York City, at New York, N. Y., at 2:30 p. m. on Saturday, April 10. The meeting has been called for the purpose of electing directors to fill the present vacancies on the board, for electing an executive committee, for considering the progress report of the committee on the joint congress of the American Road Builders' Association and the American Highway Association and for such other business as may come up.

Among those who presented papers at the recent Second Canadian and International Good Roads Convention and Exhibition were the following officers and members of the A. R. B. A.: President George W. Tillson, Consulting Engineer to the President of the Borough of Brooklyn, New York, N. Y.; Treasurer W. W. Crosby, Consulting Engineer, Baltimore, Md.; Director R. A. Meeker, State Highway Engineer of New Jersey; F. E. Ellis, Manager of the Essex Trap Rock & Construction Co., Peabody, Mass.; George C. Diehl, County Superintendent of Highways of Erie County, New York; B. Michaud, Deputy Minister of Roads of the Province of Quebec; Wm. D. Sohier, Chairman of the Massachusetts Highway Commission, and H. S. Van Scoyoc, Chief Engineer, Toronto-Hamilton Highway Commission.

At the Seventh Annual Convention of the Michigan Good Roads Association, held at Grand Rapids, Mich., March 9 to 12, addresses were made by the following A. R. B. A. members: Frank F. Rogers, State Highway Commissioner of Michigan; L. H. Neilsen, Engineer-Inspector of the Michigan State Highway Department; Jesse Taylor, President, Ohio Good Roads Federation, and George C. Diehl, County Superintendent of Highways of Erie County, New York.

MEETINGS

Second Canadian and International Good Roads Convention and Exhibition

The Second Canadian and International Good Roads Convention and Exhibition, held under the auspices of the Dominion Good Roads Association and the Ontario Good Roads Association, was held in Convocation Hall of the University of Toronto, Toronto, Ont., on Monday, Tuesday, Wednesday, Thursday and Friday, March 22 to 26. About eight hundred registered at the convention, according to reports.

The forenoon of Monday, March 22, was devoted to the registration of delegates and visitors. The first session was called to order in the afternoon, U. H. Dandurand, Honorary President of the Dominion Good Roads Association, presiding in place of W. A. McLean, President of the convention, who was unable to be present on account of illness. Addresses of welcome were made by J. S. Hendrie, Lieutenant-Governor of Ontario, who spoke on behalf of the province; Finlay G. MacDiarmid, Minister of Public Works of Ontario; Thomas L. Church, K. C., Mayor of the City of Toronto, who spoke on behalf of the city, and J. A. Sanderson, President of the Ontario Good Roads Association, who spoke on behalf of that organization. The response on behalf of the convention was made by Honorary President Dandurand of the Dominion Good Roads Association. Addresses were also made by J. A. Tessier, Minister of Roads of the Province of Quebec; B. Michaud, Deputy Minister of Roads of the Province of Quebec, and Sir Edmund Walker.

On Tuesday, March 22, technical papers were read by George C. Diehl, County Superintendent of Highways of Erie County, New York, on "Road Construction in New York State"; George W. Tillson, Consulting Engineer to the President of the Borough of Brooklyn, New York, N. Y., and President of the American Road Builders' Association, on "Wearing Surfaces"; S. L. Squire, of Waterford, Ont., on "Finance"; B. Michaud, Deputy Minister of Roads of the Province of Quebec, on "Road Laws," and Lucius E. Allen, of Belleville, Ont., on "Bridges and Culverts." Mr. Tillson's paper is printed on other pages of this issue. Among those who spoke in the discussions of the various papers were J. F. Beam, of Black Creek, Ont.; J. W. Levesque, M. P. P., of Laval, and Frank Barber, of Toronto, Ont. President Falconer of the University of Toronto, who was the first speaker of the afternoon session, welcomed the delegates on behalf of the university.

On Wednesday, March 24, papers were presented as follows: "State Roads of New Jersey," by R. A. Meeker, State Highway Engineer of New Jersey; "Foundations," by J. Duchastel, City Engineer of Outrement, P. Q.; "Machinery," by F. E. Ellis, Manager, Essex Trap Rock & Construction Co., Peabody, Mass.; "Dust Prevention," by Major W. W. Crosby, Consulting Engineer, Baltimore, Md., and "Road Organization," by George H. Henry, M. P. P., of Todmorden, Ont. Among those taking part in the discussions on these various papers were Professor A. T. Laing of the Department of Applied Science of the University of Toronto; Charles Talbot, County Road Superintendent of Middlesex County, London, Ont., and N. Vermilyea, of Belleville, Ont.

During the morning session the meeting passed a motion extending the best wishes of the association to T. L. Kennedy, of Dixie, ex-President of the Ontario Good Roads Association, who has joined the Governor-General's Body Guards for active service.

The presentation of technical papers was continued on Thursday, March 25, the following being presented: "Road Location," by C. R. Wheelock, County Road Superintendent of Peel County, Orangeville, Ont.; "Gravel and Stone Roads," by Charles Talbot, County Road Superintendent of Middlesex County, London, Ont.; "The Evolution of the Asphalt Pavement in Toronto," by George Powell, Deputy Engineer of the City of Toronto; "Good Roads and the Contractor," by H. T. Routly, O. L. S., Huntingdon, P. Q.; "Town Planning," by Thomas Adams, Town Planning Advisor, Commission of Conservation, Ottawa, Ont.; "Traffic," by Col. W. D. Sohier, Chairman of the Massachusetts Highway Commission. Among those who discussed the papers were J. F. Whitson, Superintendent, Colonization Roads, Toronto, Ont., and H. D. Cleminson, County Road Superintendent of Prince Edward County, Wellington, Ont. An address was also made by N. W. Rowell, K. C., M. P. P., who spoke on the subject of highway legislation, outlining the action being taken in the provincial Legislature.

At the session on Thursday resolutions were passed thanking the delegates in attendance from the United States, expressing sympathy for Mr. McLean, expressing the wish of the convention for a speedy disclosure of the Government's road policy and deprecating the idea of extensive road construction before the passage of legislation.

At the close of the session on Thursday afternoon the annual business meeting of the Ontario Good Roads Association was held. Officers for the coming year were elected as follows: Honorary Presidents, N. Vermilyea, of Belleville, and J. A. Sanderson, of Oxford Station; President, S. L. Squire, of Waterford; First Vice President, K. W. McKay, of St. Thomas; Second Vice President, C. R. Wheelock, of Orangeville; Secretary-Treasurer, George H. Henry, of Todmorden.

Papers presented on Friday, March 26, the last day of the convention, were as follows: "Bituminous Construction," by J. Pearson, President of the Constructing & Paving Co., Toronto; "Concrete Roads and Streets," by H. S. Van Scoyoc, Chief Engineer of the Toronto-Hamilton Highway Commission, Toronto, and "Creosoted Wood Block," by Andrew F. McCallum, City Engineer of Hamilton, Ont. Among those who took part in the discussions of these papers were Professor A. T. Laing, of the Department of Applied Science, University of Toronto, and M. E. Brian, City Engineer of Windsor, Ont.

Officers of the congress for the coming year were elected as follows: President, B. Michaud, Deputy Minister of Roads, Province of Quebec; Secretary-Treasurer, George A. McNamee, Montreal; Honorary Presidents, W. A. McLean, Chief Engineer of Highways of the Province of Ontario, and U. H. Dandurand, of Montreal; Educational Committee—W. A. McLean, Toronto; O. Hezzelwood, Toronto;

J. Duchastel, Outremont, P. Q.; R. S. Henderson, Winnipeg, Man.; R. J. Shore, Winnipeg, Man.; Lt.-Col. W. N. Ponton, Belleville, Ont.; J. A. Sanderson, Oxford Station, Ont.; H. W. Pillow, Montreal; G. A. McNamee, Montreal.

An exhibition of road building machinery and materials was held in connection with the convention. Among those exhibiting were the following: Asphalt & Supply Co., Ltd., 103 Board of Trade Bldg., Montreal; Baines & Peckover, 98 Esplanade E, Toronto; Canada Cement Co., Ltd., Montreal and Toronto; Canada Crushed Stone Corporation, Dundas, Ont.; Canadian Clay Products Bureau, Mimico, Ont.; Canada Ingot Iron Culvert Co., Ltd., Guelph, Ont.; Canadian Equipment Co., Ltd., 601 Guarantee Trust Bldg., Montreal; Canadian Fairbanks-Morse Co., Ltd., Montreal and Toronto; J. I. Case Threshing Machine Co., Montreal and Toronto; City of Toronto; Dunn Wire-Cut-Lug Brick Co., Conneaut, Ohio; Fibred Asphalt Paving Co., Ltd., 9 Front St. E., Toronto; Ideal Incinerator & Contracting Co., Ltd., Toronto; Imperial Oil Co., Ltd., 63 Bay St., Toronto; Lecky & Collis, Ltd., 43 Scott St., Toronto; Ontario Asphalt Block Co., Windsor, Ont.; Ontario Rock Co., 404 Lumsden Bldg., Toronto; Petrolgas Safety Burners, 105 Standard Bank Bldg., Toronto; Rocmac Roads, Ltd., 74 King St. E., Montreal; Alfred Rogers, Ltd., King St. W., Toronto; Sawyer-Massey Co., Ltd., Hamilton, Toronto and Montreal; The Patterson Mfg. Co., Ltd., 172 King St. E., Toronto; Trussed Concrete Steel Co. of Canada, Ltd., Walkerville, Ont.; The Philip Carey Co., 7 Front St. E., Toronto; The Creosoted Block Paving Co., Ltd., Toronto; Wettlaufer Bros., Montreal and Toronto.

Florida State Good Roads Association

The annual convention of the Florida State Good Roads Association was held at St. Petersburg, Fla., on Wednesday and Thursday, March 24 and 25.

The association has been conducting a campaign for the enactment of legislation providing for a state highway commission, and consideration of this matter occupied most of the time during the two days of the meeting. Among the speakers were Mayor J. G. Bradshaw, of St. Petersburg, who made the opening address; Representative-elect F. A. Wood, who delivered the address of welcome on behalf of Pinellas County; Dr. W. M. Stinson, of Jacksonville, formerly President of the association, who responded to the addresses of welcome; F. F. Smith, of Bridgeton, N. J.; Mayor Amos W. Corbett, of St. Augustine; Charles R. Hall, of St. Petersburg; W. A. McRae, Commissioner of Agriculture of Florida, and others.

Early on Wednesday evening the delegates and members of the association participated in an automobile parade, and later in the evening the visiting delegates were tendered a banquet by the St. Petersburg Board of Trade.

Michigan Good Roads Association

As was noted in "Good Roads" for March 20, the Seventh Annual Convention of the Michigan Good Roads Association was held at the Coliseum, Grand Rapids, Mich., March 9, 10, 11 and 12. The convention was participated in by the Western Michigan Development Bureau, the North Eastern Development Bureau, the Upper Peninsula Development Bureau, the West Michigan Pike Association, the Michigan Highway Department and the Grand Highway Association.

Sessions were held on Tuesday afternoon, Wednesday forenoon, afternoon and evening, Thursday forenoon and afternoon and Friday forenoon and afternoon. The morning of Tuesday, March 9, was devoted to the registration of delegates and to committee and other meetings, the first session being held on the afternoon of that day. Wednesday was designated as the "Second Southwestern and Sixth Northwestern Road Officials' Institute," Thursday was designated as "Michigan Good Roads Association's Day," and Friday as "Participating Organizations' Day."

Among the speakers on Tuesday were Alvah Brown, Chairman of the Kent County Road Commission, who spoke on "Kent County Roads;" Mrs. Henry Hulst, Chairman of the Committee on Planting and Parks of the Michigan State Teachers' Association, whose address was entitled "Roadside Planting and State Parks:" Dr. Ben H. Lee, of Grand Rapids, who spoke on "The Trunk Line Roads," and K. I. Sawyer, Engineer-Inspector of the State Highway Department. Chairman Brown strongly favored concrete roads in his address, and also urged the building of greater road mileages instead of building wider roads. Mrs. Hulst described the work done in European countries in roadside planting and advocated such work in this country. Dr. Lee in discussing trunk line roads spoke strongly in favor of systems of trunk lines, deploring opposition to the construction of such roads. He also expressed the belief that work by the state should be done by contract.

GROUP OF DELEGATES AT THE SEVENTH ANNUAL CONVENTION OF THE MICHIGAN GOOD ROADS ASSOCIATION—GRAND RAPIDS, MICH., MARCH 9-12.

Among those who made addresses on Wednesday were State Highway Commissioner Frank F. Rogers of Michigan; Engineer-Inspectors W. W. Cox and L. H. Nielsen of the State Highway Department; John J. Cox, Instructor in Highway Engineering at the University of Michigan, and W. M. Bryant, Chairman of the Kalamazoo County Road Commission. State Highway Commissioner Rogers spoke on the subject "Michigan Roads," reviewing the work of the Highway Commission and explaining its operation. The subject of Engineer Cox's address was "County and Township Road Organization." He advocated the formation by the township and county commissioners of a board to take charge of road work in the county and the township, and the employment of a competent engineer to look after the problems of construction. "Economic Construction of Gravel Roads" was the subject of Engineer Neilsen's address. Mr. Neilsen said that about three-fourths of the state reward roads built so far had been built of gravel and advocated the careful study of the details of such work. He also advocated careful, continuous maintenance. John J. Cox discussed "Split Log Drag Road Maintenance," advocating the use of that implement and emphasizing the necessity of periodic maintenance work. Commissioner Bryant discussed work done in Kalamazoo county.

On Wednesday evening, Deputy State Highway Commissioner L. C. Smith gave a lecture on "Bridges, Culverts and Roads." The lecture was illustrated by lantern slides.

On Thursday, March 11, addresses were made by President P. T. Colgrove of the Michigan Good Roads Association; Governor Woodbridge N. Ferris of Michigan; John Ketchum, Master of the State Grange; Congressman G. K. Diekema, of Holland; Frank F. Rogers; Jesse Taylor, President of the Ohio Good Roads Federation; George C. Diehl, Chairman of the Good Roads Board of the American Automobile Association; Chairman Bryant of the Kalamazoo County Road Commission; James J. Tobin, of the United State Office of Public Roads, and others. President Colgrove devoted much of his address to a discussion of trunk line roads, as did also Mr. Ketchum, whose address was entitled "Road Construction from the Standpoint of the State Grange." Governor Ferris' address was entitled "Rural Folks and Good Roads." He especially emphasized the value of roads as gauged by their effect upon the religious and educational life of the community as well as upon its commerce. Congressman Diekema, of Holland, took the place of N. P. Hull, Past Master of the State Grange, who was unable to be present. Commissioner Rogers spoke briefly on "Road Bills Now Pending in Our State Legislature." Mr. Diehl discussed the financing of road improvement and commended the work done in Michigan by Commissioner Rogers. Mr. Taylor's address was "Coming Through the Mud," and Mr. Tobin criticised American methods of road work, with especial reference to methods of administration. Mr. Bryant's address was entitled "The Use of Prison Labor on Our Highways."

On Thursday the report of Secretary A. A. Anderson was read, and officers were elected for the coming year as follows: President, Philip T. Colgrove, of Hastings; Vice President, N. P. Hull, of Dimondale; Secretary, A. A. Anderson, of Hastings and Treasurer, J. Edward Roe, of Lansing. The following were appointed by President Colgrove as the Board of Trustees: Roy D. Chapin, of Detroit; Alvah W. Brown, of Grand Rapids; W. K. Prudden, of Lansing; John N. Lentz, of Monroe; Dr. George F. Young, of South Haven; A. H. Dudley, of Jonesville; Frank Hamilton, of Traverse City; W. M. Bryant, of Kalamazoo, Charles Farrin, of Mt. Clemens, and C. E. Parmerlee, of Lapeer.

On Thursday evening a dinner to the officers of the State Association and the speakers was given at the Livingston Cafe by the Local Convention Committee.

Friday was designated as "Participating Organizations' Day," and among those who spoke were D. H. Day, President of the Western Michigan Development Bureau, whose subject was the "Western Michigan Development Bureau;" L. H. Conger, Secretary of the West Michigan Pike Association, who spoke on the "West Michigan Pike;" Dr. Wm. D'Klein, President of the West Michigan Pike Association, who addressed the convention on "Health First Along the Pike"; Congressman J. C. McLaughlin, who spoke on "National Aid Sentiment in Congress;" R. F. Sherwood, of Watervleit, who spoke on "Trunk or Local Highways;" J. D. A. Johnson, of the Muskegon Chamber of Commerce, who spoke on "The Pike from a Business Man's Standpoint;" R. F. Hoffman, of the Manistee County Good Roads Commission, and others.

An exhibition of road building machinery and materials was held in connection with the convention.

Association of County Road Engineers of Kentucky

The Association of County Road Engineers of Kentucky held its annual meeting at the Seelbach Hotel at Louisville, Ky., February 24, 25 and 26.

The first two days were devoted to addresses and discussions. Among the speakers on the program were P. St. J. Wilson, Assistant Director of the United States Office of Public Roads; Robert C. Terrell, State Commissioner of Public Roads of Kentucky, and A. R. Hirst, State Highway Engineer of Wisconsin. On the evening of February 24 the delegates to the convention were guests at a banquet of the Louisville Convention and Publicity League at the Galt House. On the afternoon of February 26 an automobile inspection trip was made over the roads of Jefferson County.

Officers for the coming year were elected as follows: President, Jacob Strous, County Road Engineer of Larue County, Hodgeville; First Vice President, W. H. Edwards, Jr., County Road Engineer of Woodford County, Versailles; Second Vice President, W. P. Caldwell, County Road Engineer of Boyle County, Danville; Third Vice President, C. S. Woodward, County Road Engineer of Jessamine County, Wilmore; Secretary J. Frank Grimes, of Louisville; Directors: Robert C. Terrell, State Commissioner of Public Roads; J. Russell Gaines, County Road Engineer of Jefferson County, Louisville; R. W. Davis, County Road Engineer of Fayette County, Lexington; J. R. Thompson, County Road Engineer of McCracken County, Paducah; B. F. Bacon, County Road Engineer of Hart County, Munfordville, and J. H. Van Horne.

NEWS NOTES

The Construction of Five Miles of Concrete Highway in Will County, Illinois, is proposed for the coming season. According to reports, the county now has five miles of such road on the route of the so-called Lincoln Highway. The work contemplated for the coming season will also be upon that highway.

The Issuing of Bonds to the Amount of $672,500 will be voted upon in Kings County, California, on May 6. The decision to call the election was made by the Board of County Supervisors at a recent meeting, in accordance with a report of the County Highway Commissioners. The report recommends the construction of a system having a total mileage of 102¾ miles of 16-ft. bitumen bound broken stone road.

The City of Charlotte, N. C., has recently purchased equipment for doing its own street repair work, and it is expected that the Street Department will soon be in a position to do all of the repair work on the paved streets and also to construct and repair macadam streets, using the department forces. The equipment purchased so far includes a Russell grader and a Hooke asphalt paving repair plant. The purchase of a portable rock crusher has also been authorized.

PERSONAL NOTES

E. J. Miner has resigned as Assistant City Engineer of Cincinnati, Ohio.

John J. Albertson has been appointed City Engineer of Collingswood, N. J.

Edward M. Bigelow has resigned as State Highway Commissioner of Pennsylvania.

Walter F. Slade has been reappointed Commissioner of Public Works of Providence, R. I.

Butler Smith, of Milbank, S. D., has been appointed County Surveyor of Grant County, South Dakota.

R. B. Preston has received a temporary appointment as Road Engineer of Norfolk County, Virginia.

Walter Rider has been appointed Street Commissioner and Water Superintendent of Snohomish, Wash.

Robert Caldwell, formerly City Engineer of Beloit, Wis., has been appointed Superintendent of Streets of Beloit.

W. A. Calderhead has been appointed County Surveyor of Teton County, Idaho. The county has recently been formed.

Eugene Crawford and E. D. Estey have been elected City Engineer and Street Commissioner, respectively, of Waterville, Me.

Paul E. Kressly has resigned as City Manager of Inglewood, Cal. Before becoming City Manager, Mr. Kressly was City Engineer.

Walter A. Mickle, of Winston-Salem, N. C., has been appointed Secretary of the Forsyth County Highway Commission, North Carolina.

Clarence A. Bingham, Assoc. M. Am. Soc. C. E., recently Deputy City Engineer of Elizabeth, N. J., has been appointed Town Manager of Norwood, Mass.

Spire Pitou, Jr., has been appointed Commissioner of Public Works of the Borough of Richmond, New York, N. Y., to succeed Lewis Nixon, who recently resigned.

John E. Bowe, formerly Street Cleaning Commissioner of the Borough of Richmond, New York, N. Y., has been appointed Deputy Commissioner of Public Works of that borough.

Milton H. Bronsdon, Chief Engineer of the Rhode Island Co., has recently been appointed to the newly created office of Deputy Commissioner of Public Works of Providence, Rhode Island.

P. A. Gibbons has been appointed Assistant Engineer in Charge of Maintenance of Streets in the City Engineer's Department of Baltimore, Md., succeeding C. O. Vandevanter, resigned.

John J. Collins has been appointed Street Cleaning Commissioner of the Borough of Richmond, New York, N. Y., to succeed John E. Bowe, who has been made Deputy Commissioner of Public Works.

H. E. Bilger, Road Engineer, Illinois State Highway Department, has recently been transferred from the grade of Associate Member to that of Member in the American Society of Civil Engineers.

C. D. Shauver has been appointed Assistant State Engineer of Wyoming. Mr. Shauver was an engineer in the United States Reclamation Service for three years, and has also served two years as Assistant City Engineer of Sheridan, Wyo.

James Shakman, formerly Assistant Chief Chemist in the laboratory of the Chicago Bureau of Streets, has recently joined the staff of Walter H. Flood, Consulting Chemical Engineer, of Chicago, Ill., and has assumed the direction of the road materials laboratory maintained by Mr. Flood.

Otis F. Clapp, M.Am.Soc.C.E., has been appointed First Assistant Engineer of the Department of Public Works of Providence, R. I. Mr. Clapp was City Engineer of Providence from 1897 until a recent law created the office of Deputy Commissioner of Public Works and made the holder of that position also City Engineer.

REPORTS

MASSACHUSETTS, CONCORD, ANNUAL REPORT OF THE ROAD COMMISSIONERS; for the year ending December 31, 1914. Paper; 6x9 ins., 38 pp.

This report includes the report of John M. Keyes, Samuel E. Lufkin and Martin A. Williams, Road Commissioners; the report of Robert J. H. Worcester, Superintendent of Roads and Bridges, to the Road Commissioners, and a number of tables showing details of the work of the year.

SOUTH CAROLINA DEPARTMENT OF AGRICULTURE, COMMERCE AND INDUSTRIES; Eleventh Annual Report of Commissioner E. J. Watson to Governor Blease; for the year 1914. Paper; 6x9 ins., 390 pp.; illustrated.

The portion of this report devoted to highways comprises 21 pages and includes a discussion of the road situation in South Carolina. Especial attention is paid to the matter of revenues and to that portion of the so-called Washington to Atlanta Highway situated in South Carolina.

NEW YORK, N. Y., BOARD OF ESTIMATE AND APPORTIONMENT; Report of Nelson P. Lewis, Chief Engineer of the Board of Estimate and Apportionment of New York City, to Mayor John Purroy Mitchel; for the year 1913. Cloth; 7x10 ins., 293 pp., including inset tables.

Besides the report of Chief Engineer Lewis, there are included in this report the report to Mr. Lewis by Deputy Engineer Arthur S. Tuttle and a large number of tables accompanying the latter report. A considerable portion of the report is devoted to street matters, including a discussion of the city plan, a discussion of repaving and a discussion of grade crossing elimination. In the 40 tables accompanying the report are detailed data on street work and its cost.

NEW HAMPSHIRE STATE DEPARTMENT OF HIGHWAYS; Annual Report of State Superintendent of Highways S. Percy Hooker to the Governor and Council; for the years 1913 and 1914. Cloth; 6x9 ins., 91 pp.; pocket with map.

This report consists principally of tables showing the details of the work of the department during the period covered by the report. In addition, there is a brief outline of the work, with especial reference to trunk lines, state roads and the general policy of the department. The financial statement included in the report covers the fiscal years from August 31, 1912, to August 31, 1914. A pocket on the back cover contains a large-scale map of New Hampshire, on which state aid roads, the Merrimac Valley Road, the East Side Road, the West Side Road, the South Side Road, the Meredith-Ossipee Road and the state roads are shown.

BALTIMORE COUNTY (MARYLAND) ROADS ENGINEER, Annual Report for the year ending December 31, 1914. Paper; 6x9 ins., 91 pp.; illustrated.

This report consists largely of tabular data arranged by districts showing the work of the Roads Engineer and the various supervisors during the past year. It contains also a summary of bridge work in 1914, a table of data on painting bridges, a table showing roads oiled by the county, a table showing the mileage of different kinds of roads in the county and similar data. The illustrations show improved roads and bridges built by the county.

MINNESOTA STATE HIGHWAY COMMISSION; Report of the State Highway Commission to the Governor; for the year 1914. Paper; 6x9 ins., 235 pp.; illustrated; insets.

In this report are included, besides the report of the commission, the report of State Engineer George W. Cooley; a digest of the Minnesota road laws; several pages on road construction, road machinery and road maintenance; individual reports from the various counties of the state, by the district engineers; a chapter on steel and concrete bridges; tables, and an inset map of Minnesota showing state roads and state rural highways. The illustrations show road machinery, roads before and after improvement and bridges.

IDAHO STATE HIGHWAY COMMISSION, FIRST BIENNIAL REPORT, for the period ending December 31, 1914, submitted under date of January 2, 1915, to Governor John N. Haines. Paper; 6x9 ins., 81 pp.; illustrated; insets.

Included in this are the report by the Chairman of the Commission, the report of the State Highway Engineer, a list of grading proposals received and contracts awarded during 1914 for state highways, reports from the various counties, a chapter on "Types of Roads," specifications for the construction of state roads, and various tables showing data on the work of the commission. The illustrations consist of drawings showing the organization of the State Highway Department, cross sections of roads, bridge and culvert plans, and halftones showing roads under construction and completed, bridges and various features of highway work in the state. These illustrations are grouped together at the back of the book, two of them being large inset illustrations. One of these shows a gravel crushing plant and the other the proposed location of a portion of the Idaho-Pacific Highway at Lewiston. The report also contains an inset map of the state highway system.

NEW PUBLICATIONS

PENNSYLVANIA STATE HIGHWAY DEPARTMENT, BUREAU OF TOWNSHIP HIGHWAYS, Bulletin No. 10—"Specifications for Steel Highway Bridges," issued by the Bureau for the Information of Township Supervisors. Paper; 6x9 ins., 28 pp.

This bulletin is similar to that entitled "Specifications for Culverts and Short Span Concrete Bridges" (Bulletin No. 9), which was noted in "Good Roads" for March 6. Like that one, it includes the form for advertisements, paragraphs containing information for bidders, and forms for proposals, bonds and articles of agreement, as well as the specifications proper.

CONCRETE HIGHWAY CONSTRUCTION. Paper; 6½x9 ins., 36 pp.; illustrated. Published by the Atlas Portland Cement Co., 30 Broad St., New York, N. Y.

This book, the sub-title of which is "A Text-Book for Highway Engineers, Officials and Builders," consists of a brief treatise on the construction of one and two-course concrete roadways and a form for itemized proposals for concrete road construction, together with explanatory notes on the latter. The illustrations comprise cross sections of concrete pavements and drains and reproductions of photographs showing concrete roads under construction and completed.

NEWS OF THE TRADE

The Insley Mfg. Co., of Indianapolis, Ind., is issuing Bulletin No. 11, entitled "The Insley Equipment for Road Building." The booklet is 6¼ by 9¼ ins. in size and contains 8 pages. The machines described in the bulletin are those for excavating, grading and loading. The booklet is illustrated with drawings showing the construction of the machines and with halftones showing excavators in operation.

The Charles T. Topping Machinery Co., of Pittsburgh, Pa., has announced the removal of its offices to Suite 928, Oliver Bldg. The company handles a general line of contractors', mine and quarry equipment, including Koehring concrete mixers, Clyde hoisting engines and derricks, Wylie concrete distributing systems, Hotchkiss steel forms, Easton industrial cars and railway systems, Converse portable sand screens, and other machinery.

"Money Making Mixers" is the title of a booklet issued by the Cement Tile Machinery Co., of Waterloo, Ia. The booklet is 10¾ by 7¾ ins. in size and contains 24 pages devoted to the description and illustration of the line of concrete mixers manufactured by the company. Each page carries an illustration showing a mixer or some particular feature of its construction. The booklet is printed on white paper with brown covers printed in red and black.

"The Road Doctor" is the title of a booklet recently issued by the New Way Paving Corporation, of New York, N. Y. The book, which consists of 8 pages and cover, is 8 by 6¼ ins. and is devoted to a description of the "Finley Method" which is employed by the corporation in highway maintenance and construction. The book also contains a number of testimonials, and is illustrated by views of roads treated by the Finley method. The company was recently incorporated under the laws of New Jersey, the incorporators being J. B. Salmon, of Hackettstown; Frank B. Earl, of East Orange, and Herbert K. Salmon, of Stanhope.

A 56-page booklet entitled "Montezuma Asphalt" has recently been issued by the Warner-Quinlan Asphalt Co., of New York, N. Y. The contents include lists of the cities in which Montezuma asphalt was used in 1914, reports of analyses, letters from users, and other matter, including specifications for the use of asphalts. The book is profusely illustrated by excellent halftones showing streets built with Montezuma asphalt, the application of the material, its use in construction, the company's plant at Warners, N. J., and scenes at the plant. The illustrations are printed in green, the text being in red and green. The covers are of buff, with the title embossed in red.

A suit brought by the Warren Bros. Co., of Boston, Mass., against the City of Calgary, Alberta, and the Canadian Mineral Rubber Co. has recently been decided in favor of the plaintiff. The suit was the result of an alleged infringement by the defendants of the Canadian patents of Warren Bros. Co. covering the bitulithic pavement. The contract in question was awarded in 1912 and amounted to about $300,000. A surety company bond amounting to $75,000 was required of the contractor by the city, and another bond of $60,000 was filed by the contractor when a preliminary injunction was issued. The case was tried in December of last year before Justice Hindman in Calgary, whose decision remands the case to a referee to determine damages, and directs payment to the plaintiff of the amount determined.

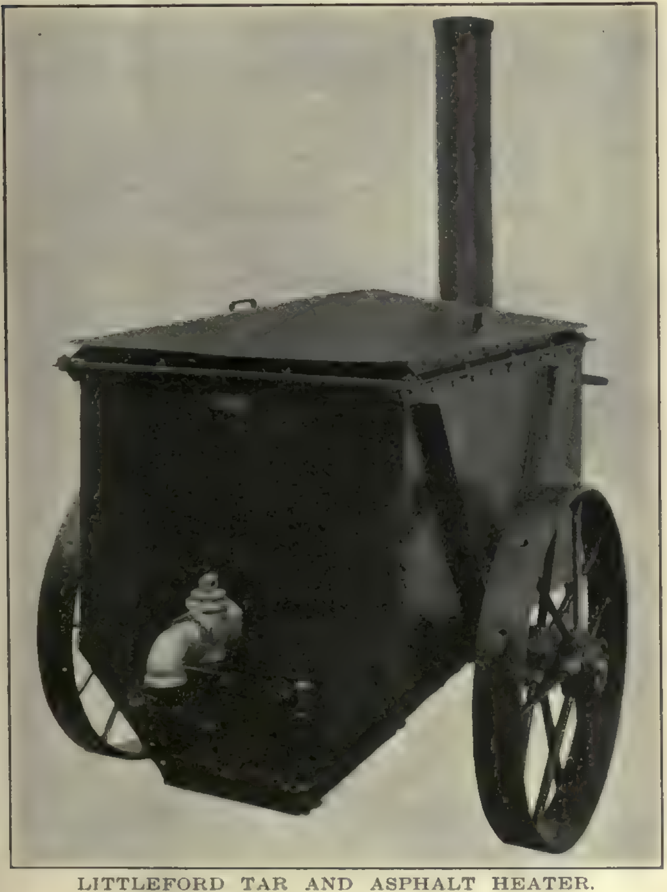
Since the contract was awarded the Canadian Mineral Rubber Co. has passed into the hands of receivers, who now report the company to be insolvent, which makes the surety company liable for the judgment.

"Rocmac Roads" is the title of a 24-page booklet recently issued by the Rocmac Road Corporation of America, Cleveland, Ohio. The text includes a history of Rocmac, a description of Rocmac road binder, an explanation of the methods of building Rocmac roads and other information relative to roads of this type. There are also included several testimonials and a list of users of Rocmac. The booklet is well printed on white paper of especially good quality and is profusely illustrated by half-tone reproductions of photographs showing Rocmac roads completed and under construction. The covers are green, the printing being in red and black.

NEW MACHINERY AND APPLIANCES

Tar and Asphalt Heater

A new type of tar and asphalt heater for use in road and street work is shown in the accompanying illustration.



LITTLEFORD TAR AND ASPHALT HEATER.

The heater is made of steel plates riveted with ⅜-in. rivets, spaced approximately 3 ins. center to center. The stiffeners and all frame members are rolled forms, the former consisting of 3x2x¼-in. angles. The height from the ground to the top of the kettle is 43 ins., and the furnace is 48 ins. long and 31 ins. wide. The kettle rests entirely within the furnace, permitting the admission of direct heat from all sides, and is so arranged that by removing a few bolts it can be easily taken out for cleaning. The firebox is provided with heavy cast iron grate-bars, and the outside of the furnace is protected from direct fire by heavy steel liner plates. The axle, which is a 2-in. square bar, tapered and machine turned on the ends, is attached entirely to the outside of the furnace. The wheels are heavy and are provided with cast iron hubs and sand guards. The spokes are staggered and the tires have 4-in. faces.

Among the special claims made for the machine are its small height, which makes it easily accessible, and the arrangement of the kettle to permit of easy removal for cleaning.

The appliance is known as the Littleford tar and asphalt heater, and is manufactured by Littleford Bros., of Cincinnati, Ohio. The heater illustrated is that known as No. 69.

NEWS NOTES

A Bond Issue of $150,000 has been voted in Saratoga Precinct of Hardin County, Texas. The issue carried by a vote of 220 to 69.

Stanislaus County, California, has recently agreed to purchase $125,000 worth of state highway bonds, with an additional $10,000 worth if that amount be found necessary to complete a portion of the state highway between Oakdale and Salida. This stretch of road is 15 miles in length and is the last link necessary to connect Modesto in Stanislaus County with Sonora in Tuolumne County.

An Election on a $100,000 Bond Issue for road work will be held in Oldham County, Kentucky, on April 20. It is the intention of the county authorities to use the money secured from the sale of the bonds, and the $50,000 of state aid which will be obtained by the county, for the reconstruction of the county highways.

A Bill Authorizing the Issuance of $300,000 in Bonds in Davidson County, North Carolina, and appointing a Board of Road Commissioners has been passed by the North Carolina Legislature. The County Road Commission is composed of Dr. E. J. Buchanan and Lee V. Phillips, of Lexington; Dr. J. W. Peacock and J. W. Lambeth, of Thomasville; T. H. Livengood, of Midway, and L. A. Smith, of Cotton Grove.

Plans and Specifications for Highway Improvement in District No. 2 of Lowndes County, Mississippi, have recently been completed. According to present plans, the work will be done on about 22 miles of road in District No. 2 and adjoining districts. The work is to be carried on with funds derived from a recent $50,000 bond issue. A description of similar work under a previous bond issue was printed in "Good Roads" for March 6.

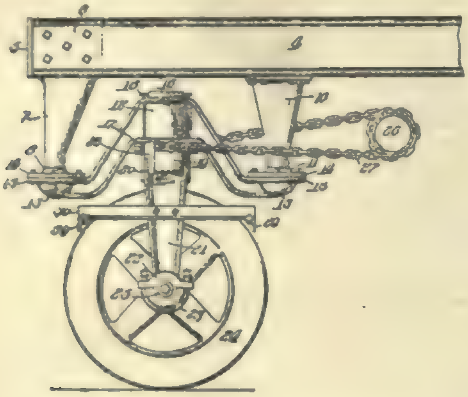
About $1,000,000 was Expended for Street Improvement Work in Oakland, Cal., during the past fiscal year, according to a recent report of William J. Backus, Commissioner of Streets. The city at present has 37 miles of asphalt pavements and 307 miles of macadamized streets, 51 miles of the latter being oiled. The City Council has recently authorized paving work which will cost $100,000. A large amount of this work will be done in districts which have been annexed to the city.

The Dixie Highway Association of Warren County, Kentucky, was organized at a recent meeting at Bowling Green, Ky. Officers were elected as follows: President, W. F. Funk; Vice presidents, County Judge H. H. Denhard, County Road Engineer M. H. Crump, Dr. A. T. McCormack, W. C. Sumpter and Mayor Alex Y. Patterson; Secretary and Treasurer, J. Grover Galloway. The object of the organization is to bring about the routing of the Dixie Highway through Bowling Green instead of through Glasgow and Scottsville.

The Total Expenditure for Roads and Bridges by the Province of New Brunswick, Canada, during the past year amounted to $321,287.82, according to the annual report of John Morrissy, Minister of Public Works for the Province. The provincial expenditures for roads in the different counties were as follows: Albert, $6,211.18; Carleton, $7,130.72; Charlotte, $7,228.32; Gloucester, $11,148.66; Kent, $6,236.13; Kings, $9,990.69; Madawaska, $3,219.43; Northumberland, $7,795.05; Queens, $5,694.10; Restigouche, $6,995.35; St. John, $8,439.94; Sunbury, $3,664.32; Victoria, $6,016.81; Westmoreland, $6,318.82; York, $17,492.52. In addition, municipal expenditures amounted to $20,021.94.

RECENT PATENTS

The following list contains the numbers of the principal patents relating to roads and pavements and to machinery used in their construction or maintenance which have recently been issued, together with the names and addresses of the patentees, dates of filing, serial numbers, etc. In some cases the principal drawing has also been reproduced. Printed copies of patents listed may be obtained for 5 cts. each by application to the Commissioner of Patents, Patent office, Washington, D. C.

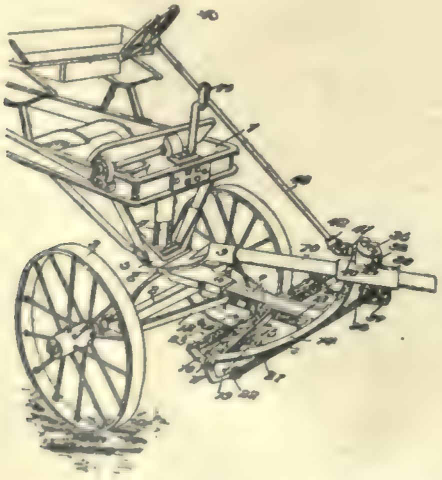


1,129,863. ROAD ROLLER. Edward Russell Greer, Minneapolis, Minn., assignor to Emerson-Brantingham Co., Rockford, Ill., a corporation of Illinois. Filed April 1, 1913. Serial No. 758,186. (Cl. 21-201.)

1,129,886. DUMPING DEVICE. Le Roy Merrow, Springfield, Ohio. Filed Jan. 24, 1912. Serial No. 673,146. (Cl. 21-20.)

1,129,936. ROAD GRADING MACHINE AND DITCHER. William R. Williams, Owensboro, Ky., assignor, by mesne assignments, to Owensboro Ditcher & Grader Co., Owensboro, Ky., a corporation of Kentucky. Filed April 1, 1914. Serial No. 828,716. (Cl. 37-5.)

1,130,086. IRON CASED BASKET STREET MARKER. Albert C. Hobbs, Huntington, W. Va., assignor of one-half to Henry C. Harvey, Huntington, W. Va. Filed Feb. 24, 1913. Serial No. 750,390. (Cl. 220-115.)

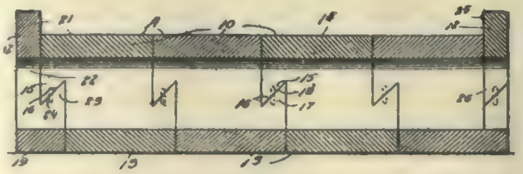


1,130,471. STEERING GEAR FOR ROAD MACHINES. David C. Boyd, Galion, Ohio, assigner to the Galion Iron Works & Mfg. Co., Galion, Ohio, a corporation of Ohio. Filed Nov. 13, 1913. Serial No. 731,097. (Cl. 21-137.)

1,130,864. CRUSHER. August W. Warsen, New York, N. Y. Filed May 20, 1914. Serial No. 839,779. (Cl. 83-53.)

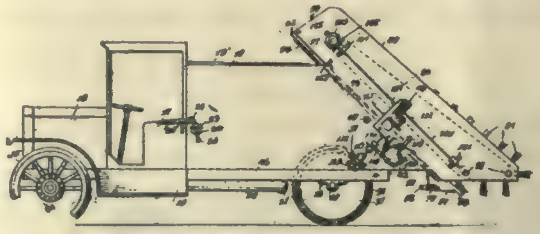
1,130,947. COLLAPSIBLE CONCRETE FORM. Elmer G. Watson, College Place, Wash. Filed April 14, 1913. Serial No. 760,869. (Cl. 25-131.5.)

1,130,996. FLANGEWAY GUARD FOR HIGHWAY CROSSINGS. Walter S. Newhall, Cleveland, Ohio. Filed Apr. 20, 1914. Serial No. 833,056. (Cl. 104-50.)

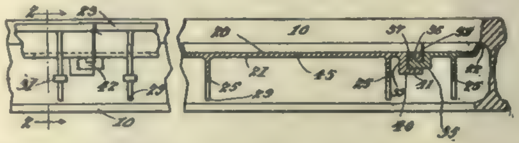


1,130,508. SECTIONAL CONCRETE CULVERT. Owen S. Hall, Red Lodge, Mont. Filed April 14, 1914. Serial No. 831,769. (Cl. 72-51.)

1,130,735. AUTOMATIC DUMPING AND READJUSTING WAGON. John F. Hughes, Darby, Pa. Filed Nov. 11, 1908. Serial No. 462,043. (Cl. 21-20.)

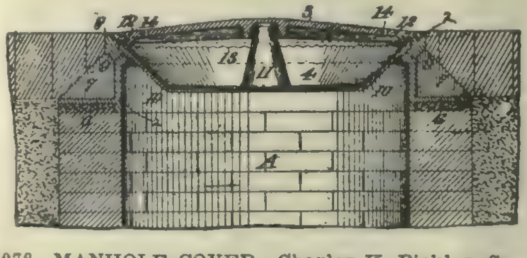


1,130,758. STREET SWEEPER. Mordecai M. Nixon, Edenton, N. C. Filed Jan. 7, 1914. Serial No. 810,824. (Cl. 15-17.)



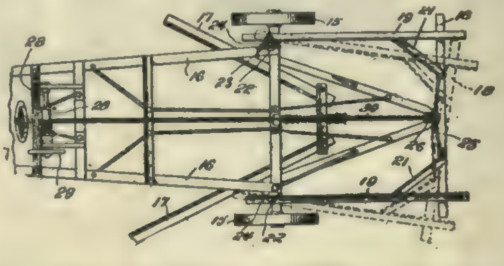
1,130,997. FLANGEWAY GUARD FOR HIGHWAY CROSSINGS. Walter S. Newhall, Cleveland, Ohio. Filed Nov. 19, 1914. Serial No. 873,040. (Cl. 104-14.)

1,131,010. PLOW DRAG. George A. Sanford, Tipton County, Tenn. Filed July 30, 1914. Serial No. 854,103. (Cl. 21-120.)



1,131,078. MANHOLE COVER. Charles K. Pickles, San Francisco, Cal., assignor to P. David & Co., San Francisco, Cal., a corporation of California. Filed April 1, 1914. Serial No. 828,686. (Cl. 94-7.)

1,131,327. MANHOLE COVER. George Caldwell, Philadelphia, Pa. Filed June 22, 1914. Serial No. 846,446. (Cl. 94-7.)



1,131,409. ROAD WORKING MACHINE. Nathaniel S. Monroe, Arthur, Ill. Filed Mar. 12, 1914. Serial No. 824,162. (Cl. 37-7.)

1,131,755. SPRING LATCH FOR WHEELED SCRAPERS. Harrison B. Walton and Jeff M. Estes, Levee Camp, Miss.; said Estes assignor to said Walton. Filed Jan. 28, 1913. Serial No. 744,631. (Cl. 37-33.)

1,131,793. COMPOUND FOR TREATING ROAD SURFACES. Walter J. Reynolds, Providence, R. I. Filed Sept. 22, 1910. Serial No. 583,307. (Cl. 134-1.)

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Notice to discontinue subscription should be sent to the New York office.

Copy for advertisements of which proofs are to be submitted to advertisers should reach the New York office as follows: For insertion in the first issue of the month, by the fifteenth of the preceding month; for other issues, by noon on Thursday of the week before date of issue.

Copy for all advertisements of which proofs need not be submitted—including "Proposal," "For Sale," "Want" and other classified advertisements—will be accepted until noon on Thursday of the week of issue.

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Statement

of the ownership, management, etc., of GOOD ROADS, as of April 1, 1915, published weekly, at New York, N. Y., required by the Act of August 24, 1912:

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No bondholders, mortgagees, or other security holders.
(Signed) E. L. POWERS, Editor & Manager.

Sworn to and subscribed before me this 11th day of March, 1915.

(Seal) O. D. CONKLIN,
Commissioner of Deeds.
Residing in Kings County.

(Certificates filed in Kings County Register's Office No. 6024; New York County Clerk's Office, No. 96; New York County Register's Office, No. 16030).

(My Commission expires March 10, 1916.)

W. S. Fallis Chosen State Highway Engineer of North Carolina

W. S. Fallis, Highway Engineer in the Highway Division of the North Carolina Geological and Economic Survey, has been chosen State Highway Engineer of North Carolina by the State Highway Commission, the creation of which was noted in "Good Roads" for March 27. Mr. Fallis has been engaged in highway engineering in North Carolina for a number of years and has had charge of highway work in various counties in that state.

The Highway Commission has been organized by the designation of Governor Craig as Chairman, Col. Cameron as Chairman Pro Tem and active head of the commission, and Dr. Joseph Hyde Pratt as Secretary. The office of the commission and the engineer will be at Raleigh.

Street Paving in Saginaw, Michigan

The paving of portions of thirteen streets at a cost of nearly $150,000 has recently been ordered by the Council of Saginaw, Mich. The work to be done is as follows:

Washington Ave.. Holland to Court, $55,756; Fayette St., Hancock to Court, $3,057; Madison St., Hamilton to Michigan, $2,183; Carroll St., Warren to 3rd, $6,057; 5th Ave., Cherry to Walnut, $11,730; Mott St., Weadock to Genesee, $13,677; Simoneau St., Sheridan to Weadock, $7,169; Martha St., west line of Lot No. 13, Block No. 3, C. Langlass' addition to Weadock Ave., $1,173; Tuscola St., 2nd to 6th, $9,098; Weadock Ave.. Hoyt to Mott, $11,398; Millard St., Jefferson to Warren, $5,058; Jefferson Ave., Holland Ave. to C. S. & M. R. R. tracks, $12,018; Jefferson Ave., C. S. & M. R. R. tracks to Rust Ave., $8,612.

All of the streets will be 26 ft. wide except Washington and Fayette, which will be 50 ft. and 30 ft. wide, respectively. Jefferson St., between the C. S. & M. tracks and Rust St., will be paved with brick, and Washington St. will be paved with creosoted wood blocks. The remaining streets will be paved with asphalt.

Proposed Street Work in Nashville, Tennessee

An issue of bonds to the amount of $430,000 has been voted by the City Commissioners of Nashville, Tenn. The issue consists of $230,000 of 5 per cent. street improvement bonds to be used for the payment of the portion of the cost of street improvement assessed against the owners of abutting property and $200,000 of 5 per cent. general improvement bonds for defraying the city's portion of the expense. The proposed street improvements and their costs are as follows:

Wood block paving: Broadway, $10,341.75; Cedar St., $36,322; 8th Ave., $50,325; 3rd Ave., $55,816.

Bitulithic: 8th Ave., $4,958.25; 6th Ave., $8,969.45; 12th Ave., $21,233.55; 15th Ave., $9,673.95; Lyle Ave., $3,415.50; 2nd Ave., $28,189.50.

Granite block: 11th Ave., $30,712; 1st Ave., $9,850.50; 10th Ave., $11,223.20; Clark St., $2,556.40; Commerce St., $4,158; Union St., $1,972.

Concrete: Alley No. 906, $2,161.77.

Bituminous macadam: 15th Ave., $24,109.96; Myrtle Ave., $7,407.40; 9th St., $8,287.40; 31st Ave., $7,810.09; Phillip St., $3,239.10; Branch Ave., $5,632.33; Forest Ave., $16,164.28; Long Ave., $17,017.82; Gartland Ave., $7,840.96; Ordway Place, $5,420.80; Holly St., $10,292.04; Lillian St., $4,469.57; Elkins Ave., $22,834.46.

Bitustone: Stratton Ave., $14,708.10; Vanderbilt Place, $9,901.65; Boscobel St., $5,908.10; Dixie Place, $13,295.70; Mansfield Ave., $8,285.20; Russell St., $10,904.52.

The Canadian Bitulithic Patents Adjudged Valid by the Supreme Court of Alberta

As noted briefly in "Good Roads" for April 3, a suit recently brought by the Warren Bros. Co., of Boston, Mass., against the City of Calgary, Alberta, and the Canadian Mineral Rubber Co. has recently been decided in favor of the plaintiff, the judgment having been handed down by Justice Hyndman on March 16. The text of the decision, which is now available, is as follows:

"The plaintiffs seek an injunction and damages against the defendants for an alleged infringement of certain of their rights as licensees and patentees respectively, namely: claims 4-5-6-9 and 11 of a certain '*new and useful improvement in street pavements*', letters patent for which were duly granted pursuant to the 'Patent Act' of the Dominion of Canada, on the 5th day of July, 1904, numbered 88,116, in favor of Frederick John Warren and his assigns, giving him the exclusive right, privilege and liberty within Canada of making, constructing, manufacturing and vending the said improvements, which patent is still in force. By assignment all the right, title, estate and interest in and to the said letters patent was granted to the plaintiffs, Warren Brothers Company, and the plaintiffs, Bitulithic & Contracting, Ltd., are the sole licensees within Alberta of their co-plaintiffs.

"Warren Brothers Company also possess the same patent rights throughout the United States of America and have done a very large business either by themselves or through licensees both in Canada and the United States, and the case is a most important one for the plaintiffs as well as for the City of Calgary and other communities in Alberta, affecting, as it does, their right to construct such pavement municipally or through other contractors, for, in addition to the question whether plaintiffs' patent has been in fact infringed upon, the defendants also challenge the validity of the patent itself. The case is therefore entitled to very careful consideration. * * *

"The defendants, the Canadian Mineral Rubber Company, undertook to and did construct the alleged infringing pavement under a contract with the City of Calgary, the circumstances in connection with which are briefly about as follows:

"In March, 1912, the defendant city advertised for tenders for pavement to be constructed that year. Several tenders were presented, amongst them being those of the Bitulithic & Contracting, Ltd., and the defendant company. One Doctor Elliott, as agent for defendant company, appeared before a meeting of the City Council and openly offered to construct pavement identical with a pavement which the plaintiffs, Bitulithic & Contracting, Ltd., had laid down in Calgary in 1910 and 1911 and which plaintiffs allege was their patented pavement. Mr. McPhail, the manager of the Bitulithic & Contracting, Ltd., was also present and pointed out to the council in the presence and hearing of Dr. Elliott that their pavement was patented, and that if defendants proceeded to construct such a one his company would take legal proceedings to enjoin them from so doing. Dr. Elliott contended that such patent was not valid and said that he would undertake to fight any claim the Bitulithic & Contracting Co. might set up; that he knew it was a patented pavement, but such patent 'was not worth the paper it was written on.' Mr. Child, the then City Engineer, was also present and drew the attention of the council to the same point. It was eventually decided that a contract be let to the defendant company to construct 100,000 yards of pavement under specifications identical with those of Bitulithic & Contracting, Ltd., in 1910 and 1911, and at the suggestion of Mr. Child a clause was inserted in the formal contract, dated the 9th of April, 1910, Exhibit 7, which reads as follows:

"'26. By reason of the fact that the contractor agrees by the specifications attached to and forming part of this contract to lay down pavement similar to Warren's bitulithic pavement recently laid down in the city by the Bitulithic & Contracting, Ltd., it is distinctly agreed and understood by and between the contractor and the corporation that if any legal proceedings are instituted against the contractor or corporation or both for an infringement of any patent, and as a consequence thereof the work comprised under this contract is stopped, discontinued or interfered with by order of a court or judge for a period of twenty days, whether consecutive or not, the corporation shall have the right to cancel this contract at any time thereafter by giving written notice to that effect in a prepaid registered letter addressed to the contractor at Calgary, Alberta, and thereupon all further rights of the contractor under this contract shall cease and determine and the corporation shall have the right to take possession of the work and complete the same in the manner provided in Section 16 hereof, and the contractor agrees to indemnify the corporation against all claims, damages, suits or actions brought against the corporation for infringement of any patent by the contractor and any sums for which the corporation may be liable shall, if not paid forthwith by the contractor, be a charge on the bond accompanying this contract. In the event of the commencement of any actions or proceedings against the corporation, whether the contractor is a party or not, the corporation hereby gives and grants to the contractor the carriage and conduct of the same in the name and on behalf of the corporation and at the contractor's sole cost and expense.'

"Construction was begun and the plaintiffs applied to my brother Stuart for an injunction restraining further work, but instead of enjoining defendants it was ordered that moneys which would fall due from time to time from the city under the contract be paid into court, leaving plaintiffs' remedy in damages alone. The defendant company continued the, work which was not completed until some time in 1914.

"Assuming for the time being that the plaintiffs' patent is valid, I will consider first whether or not the defendants in fact infringed their rights. Plaintiff put in evidence subject to objection, exhibits 10 and 11, being reports from J. W. Howard, an engineer of New York, to defendant, citing with reference to the composition of the pavements as laid in Calgary by both Bitulithic & Contracting, Ltd., and the defendant company, tending to prove the similarity of both pavements, and that they were constructed according to the patent.

"Mr. Howard was not an employee of the city, but merely acted as consulting engineer, and was paid for services rendered in specific cases only. My opinion under the circumstances is that these reports are not properly admissible, and I uphold Mr. Biggar's objection.

"But, to my mind, even without this evidence there is ample testimony which establishes infringement.

"According to witnesses Child, the ex-Engineer, and Field, the Chemist, of the defendant city, the pavement of the defendant company was doubtless constructed according to the plan or method described in plaintiff's patent. Field says he checked the weights and saw the batches of mineral aggregate from time to time and that the specifications were observed carefully, and Craig says the same thing as to following the specifications. I am of opinion that the ingredients employed correspond to the approximate quantities of the materials as described in the patent. The evidence is quite satisfactory that the result was similar to plaintiffs' pavement laid the previous year. The specifications used were similar to those of the plaintiffs in laying the 'bitulithic.' Therefore if the specifications are the same as were used in manufacturing plaintiffs' protected pavement and comprise the method or scheme of the patent, there is no doubt in my mind that the defendants are guilty of infringement.

"In considering the question of validity, it is necessary to look at the whole of the specifications and claims which I set out fully at the conclusion of the judgment.

"The United States patent, which is identical with the one in question, has been the subject of litigation in several states of the Union, and plaintiffs, Warren Brothers Company, have in each case been successful in establishing validity of their patent. The Canadian patent law has, to a large extent, been moulded after the United States laws rather than the English, and decisions in our courts have followed the American rather than the English in many respects.

"In England it appears the plaintiffs must establish at least a *prima facie* case of novelty, sufficiency and utility. In the United States the patent carries with it a presumption to this effect, and the Canadian decisions appear to have followed in this respect, and I so hold in this action.

> "*Copeland v. Lyman,* 90 O. R., 908. Fisher and Smart on Patents, 215 to 225, and the cases cited there.

"The onus, therefore, is upon the defendants to prove want of novelty, sufficiency of specifications and utility. I held at the trial that it was incumbent on the plaintiffs to prove manufacture as required by the statute, which they did to my satisfaction.

"The only remaining points to be decided then are as to (1) novelty, (2) sufficiency and (3) utility.

"The invention relates to an 'improvement in street pavements' (not a process) which comprises a base of mineral matter and a plastic uniting medium consisting of a natural or artificial asphalt or coal tar composition which are intimately associated together and used as the upper or top surfacing of the roadbed. Validity must be decided according to the state of knowledge at the date of the patent (*Vidal v. Levinstein,* 29 Rep. Pat. Cas., 259). It is therefore necessary to ascertain what anticipation there has been by any of the known practical methods of construction of pavements, considering it not as of the present day, but during the period immediately prior to that of the plaintiffs' patent. On the evidence I cannot find that there had been any pavements similar in construction to that of the plaintiffs'. It is quite true that density and stability had been for many years considered most desirable and, in fact, were sought to be accomplished in various countries, but there does not appear to have been any fixed or known working scheme which would insure it with any degree of certainty. The old methods included granite, stones and wood blocks, brick, as also macadam, tar asphalt and sheet asphalt. The form which most approaches 'bitulithic' appears to have been sheet asphalt. The old familiar macadam was made of irregular sizes of fairly large broken stone and laid usually in three uniform layers. These layers were crushed down with heavy rollers and on the top small stones, stone dust, or street sweepings were rolled into this which formed a temporary cement. The mixture contained a large percentage of voids and would absorb dust, moisture, deposits of horses, etc. The structure changed continually, according to the amount of traffic. It became very dusty in dry weather and muddy and slippery after rain, and was also unsanitary. Tar macadam was the ordinary macadam structure, with a coating of tar. Tar concrete had never been used for street pavements but only for sidewalks. Tar macadam and macadam are often the foundation for the plaintiffs' pavement. Sheet asphalt is composed merely of sand, the interstices being filled with asphalt cement. It is subject to the disadvantage of being too hard and brittle in winter and liable to fracture under traffic, as well as being very slippery in wet weather, especially so on slopes. The voids, too, in sand run from 30 to 38 per cent., requiring therefore a very large percentage of expensive cement to fill the spaces. It appears, without doubt, that the great object in view was the production of a waterproof pavement with the least number of voids; inherent stability and resistance to wear, as well as being dustless, noiseless and sanitary and free from liability to fracture.

"It appears from the evidence that Warren, the inventor, who was a paving contractor, made the business his life work and carried on many experiments. The result of his experiences was that he regarded all pavements up to this time as wrong, owing to the arrangement of the mineral matter, and claimed that he discovered by experiment that the usual method, namely, a mixture of sand or fine gravel united by the plastic asphalt vehicle, contained a larger percentage of voids than in a mixture of a relatively larger size. His invention was the discovery that an aggregate of large and small pieces of stone, graded down to an impalpable powder, mixed together in certain proportions, would produce a mixture having less than 21 per cent. of voids and when so assembled and compacted together would form a dense, solid, homogeneous body with the smallest percentage of voids and possessing the highest degree of stability and one in which the largest and smallest pieces are associated with each other indiscriminately throughout the structure and one which, because of the sizes of the pieces and their arrangement with respect to each other, offers the smallest areas of surfaces for the attachment of the plastic composition to them, so that not only is a superior binding effect or union obtained, but a smaller quantity of the plastic composition is necessary for the purpose of obtaining the superior result or product. A good deal of evidence was given on the subject of stability. It is not claimed by the inventor that his mineral aggregate has absolute or perfect stability but merely a high degree or greater than any other known pavement. Another point of value is the fact that as a result of this arrangement small particles of stone, sand or impalpable powder, being used to fill the voids and being much cheaper than asphalt, a large saving in cost is the effect in this way. * * *

"It seems to me from the evidence that, although it might be admitted that other pavements, e. g. macadam, may possibly possess as great a density and great stability, still the process is altogether different and full of uncertainty. There was no way of ascertaining the density until after it was laid and treated and rolled on the street. The bitulithic, as to all these features, is prepared and may be known in advance and is laid down with at least an approximate certainty of its density. The inventor reduced the composition of the mineral aggregate to a certainty which before was uncertain and usually mixed in a haphazard way, 'hit or miss' as Engineer Craig put it, and this both as to quality and quantity of the mineral ingredients.

"Defendants put in as exhibit 12, copy of United States patent No. 104,325, dated 14th June, 1870, granted to Gabriel Leverick and A. H. Emery, as evidence of anticipation of plaintiffs' patent. A careful perusal, however, leads me to the opinion that, although the principle or idea very much resembles that of the patent in question, yet it is plainly distinguishable, inasmuch as stress is laid more on the treatment or quality of the tar itself rather than the composition of the mineral aggregate. (See especially paragraphs 6 and 7 of exhibit 12.)

"I have come to the conclusion, therefore, that the plaintiffs' pavement was, at the date of the letters patent, not anticipated by any other known at that time and that its novelty has not been successfully challenged.

"As to the sufficiency of the specifications, the law seems to be well settled that in return for the monopoly or privilege which is granted him in respect to his inventions, the patentee must say clearly and plainly what his invention is so that others practising the art may learn and use it with facility at the expiration of the term of the patent—'Uberrima Fides' is required in this respect.

"It does not necessarily mean that any person whomsoever may be able to apply and understand them, but that any workman acquainted with the art to which the invention belongs might make, construct and put the invention into practice. In the case at bar it would, I think, mean any person whose business was constructing pavements or analagous works. It would not, I think, include a common laborer doing a part of the rough work of construction, but rather a practical contractor, foreman or overseer.

"He must not claim too much, that is more than his specifications comprise, otherwise his patent will be invalid.

"Sufficiency being presumed, I do not see that the defendants have been successful in pointing out and proving wherein the specifications are defective. The evidence seems to be much to the contrary. The very fact that the defendant company was able to successfully construct the pavement under their contract without apparently any difficulty tends to prove this very point. * * *

"It was argued that the use of certain machinery was absolutely necessary to success in producing the result, and the inventor should have named and described carefully the various machines to be used, not only for testing, but also for the process of mixing the mineral ingredients. As these things change from time to time, I hardly think it incumbent on the patentee to go into details in this regard. The main features are the materials and the proportions thereof employed. Some of the machines for grading and separating the stone and powder are themselves patented inventions and would thus be available to anyone in the trade in the usual way. Moreover, the witness, George C. Warren, testified that the pavement has been produced without the use of the machines. Testing the material appears to be a most important feature in order to arrive at a satisfactory conclusion as to the exact proportions which ought to be used, but anyone skilled in the work ought to be able to do this without the necessity of having the specifications encumbered with details of the testing instruments and operations. Doubtless, different operators would use different methods, and methods will continue to change from time to time. The evidence of Mr. McPhail was to the effect that some of the cities in which they performed work they did not own or operate crushing machines but purchased the material from other concerns, the plaintiffs merely having to mix the various grades in the proper proportions.

"As to utility, I need say little. There is ample evidence that it is a very useful invention, and, according to City Engineer Craig, and other witnesses, the bitulithic pavement is a highly satisfactory one. I hold also that the invention is proper subject matter for a patent.

"I therefore find that the patent is valid and has been infringed, and the plaintiffs entitled to an injunction. There will be a reference to the Clerk of the Court to ascertain what damages the plaintiffs have sustained by reason of such infringement, any party being at liberty to apply from time to time for further directions. * * *"

Road Work in District No. 2, Waco County, Texas

According to a recent report made by County Engineer R. J. Windrow of Waco County, Texas, the total expenditure for road work under the bond issue in District No. 2 in Waco County, up to March 13, was $513,939. The work is being done under a bond issue of $1,075,000, which, with accrued interest, amounts to $1,115,000.

Since the beginning of operations the expenditures for engineering have amounted to $20,944, of which $13,664 was expended for salaries and the balance was used for office and field expenses. Of the remaining expenditure, the sum of $325,139 was paid on estimates.

Convict Labor on Maine Roads

What is reported to be the first use of convicts on roads in New England has recently been made in Cumberland County, Maine.

A squad of prisoners from the jail in that county has been employed on the highways of Cape Elizabeth under the direction of Sheriff William M. Pennell, of Cumberland County.

Paving Work in Minneapolis, Minnesota

Creosoted wood block, concrete and asphaltic concrete paving, which will cost over $100,000, has recently been ordered by the Paving Committee of the City Council of Minneapolis, Minn. The streets on which work will be done and the costs are as follows:

Creosoted wood block: 5th St., Northeast, $35,000; 15th Ave., Southeast, $10,000; 7th St., Southeast, $4,000; Emerson Ave., North, $24,000; 8th St., South, $7,600; Clinton Ave., $4,500; 16th Ave., South, $3,500; 13th Ave., South, $7,000.

Concrete: Queen Ave., North, $1,400; 10th Ave., North, $4,200; Sheridan Ave., North, $4,200.

Asphaltic concrete: Gramercy Ave., $2,000.

NEWS NOTES

"Good Roads Day" will be Observed in Illinois on Tuesday, April 20, Governor Dunne having designated that date in a recent proclamation.

About 15 Miles of State Aid Highway will be built in Washington County, Maryland, during the coming season, according to a recent report. It is estimated that the roads will cost about $5,000 per mile.

An Election on the Issuing of $200,000 in Bonds will be held in Mason County, Kentucky, on May 15. The funds obtained from the bonds, if voted, are to be used for work on the four main highways of the county.

Highway Work in Brown County, Wisconsin, during 1914 cost $96,977, according to the annual report of County Highway Commissioner Cromier, which was recently submitted to the County Board of Supervisors.

An Election on issuing Road Bonds to the amount of $1,250,000 will be held in Multnomah County, Oregon, on April 14. The proceeds of the bonds will be used for work on the Columbia Highway and other trunk roads.

The Board of County Commissioners of Floyd County, Georgia, has called an election for April 27 to vote on the issuance of $285,000 of county bonds. Of the total issue, $260,000 will be used for the construction of three highway bridges.

The Town of Woodward, Okla., observed March 18 as "Good Roads Day," according to reports. Three hundred farmers and a large number of men from the town spent the day making necessary repairs on a road near the village. The work was done at the instigation of the Woodward Commercial Club.

The City Council of Santa Monica, Cal., recently ordered the paving of Ocean Ave. in that city, from Pico Boulevard to the northern city limits, the vote being passed over the veto of Mayor Dudley. The portion to be paved is about two miles long, and the cost of the work is estimated at about $100,000.

New Plans for the Road Around Storm King Mountain, in Orange County, New York, are to be made by the State Highway Department, according to a recent report. Bids for the construction of Section 1 were received on Dec. 10, 1914, and it is now stated that the lowest bid received, together with the cost of engineering and the estimated cost of Section 2, would require about $60,000 more than the amount apportioned to the entire county. As it is impracticable to build Section 1 without building Section 2 also, it is now proposed to make new plans for Section 1.

Proposed Highway Legislation in Florida

At the annual convention of the Florida State Good Roads Association, a brief account of which was printed in "Good Roads" for April 3, the Legislative Committee of the organization submitted to the convention a bill providing for the establishment of a state highway department. The bill was approved by the convention, and will be brought before the Legislature.

Section 1 of the bill provides for the creation of a state road department consisting of five persons, one from each congressional district in the state, appointed by the Governor and confirmed by the Senate. The term of office is fixed at four years, except in the case of three of the first appointees, whose terms are fixed at one, two and three years, respectively. It is provided that the members of the department shall receive no compensation except the expenses actually incurred in the performance of their duties, and that the headquarters and office of the department shall be at the University of Florida at Gainesville. The department must elect a chairman and secretary, annually, and these officers may be changed at any time by a majority vote of the members. The members of the department must meet regularly at such intervals as they may decide upon, but at least semiannually.

Section 2 defines the terms "road" and "roads" as meaning all highways, including bridges or ferries, which are under the jurisdiction or control of the several boards of county commissioners.

Section 3 provides that the department shall employ as a state highway commissioner "a competent and efficient road builder." It is also provided that the department may employ such assistants to the state highway commissioner and such clerical help as may be needed and may purchase instruments and materials. It also vests in the department the fixing of the compensation of all employees.

Section 4 places upon the department the duty of collecting data and information on the roads of the state and the preparation of maps thereof; the investigation of the best methods and materials for road building and repair; the investigation of material suitable for road building and repair in the different localities of the state, and the compilation of data on these matters and their distribution to the county commissioners and the public.

Section 5 provides that the department shall, so often as practicable, have the highway commissioner or an assistant visit the several counties and inspect the roads therein and the methods employed by the county commissioners in the building of roads, and then report thereon to the department. It is also provided that all of the records, machinery, materials and other property under the control or jurisdiction of the boards of county commissioners, which relate to or are used in road building, shall at all times be subject to inspection by the state road department. It is also provided that the county commissioners must make and file with the department quarterly reports of all work done under their jurisdiction, including detailed statements of all money expended. These reports must be made in such form as the department may prescribe. It is further provided that when the road department learns of improper or extravagant work it shall call the matter to the attention of the county commissioners and, if the county commissioners then continue such work, shall report the matter to the Governor.

Section 6 makes it the duty of the department to advise the county commissioners in regard to road building, when requested to do so, sending the highway commissioner or an assistant to such county for the purpose, without expense to the county except the actual traveling expenses of the highway commissioner or assistant sent.

Section 7 places upon the department the duty of compiling the road laws of the state and reporting thereon to the Governor before the next meeting of the Legislature, making recommendations for such changes as are deemed advisable. This section also provides that the Attorney General of the state shall be the legal advisor of the department. It is also provided that the department shall render to the State Treasurer monthly statements of all expenditures, and that before the next meeting of the Legislature it shall file with the Governor a report of its operations.

Section 8 provides that in the case of the appropriation of national funds to aid the several states, the funds thus apportioned to the state of Florida shall be expended under the supervision of the state road department upon the roads designated by it.

Section 9 appropriates money for carrying out the provisions of the law; section 10 provides that the act shall become operative immediately upon its passage and approval, and Section 11 repeals all laws in conflict with the act.

Work on State Highways in Idaho

Construction work on the state highway system of Idaho to the value of $57,236.67 was done up to December 1, 1914, according to the first biennial report of the State Highway Commission, recently issued.

This work has been done on four of the six state highways laid out by the commission, which was established by a law passed in 1913 authorizing the laying out of a trunk line system and its construction at the joint expense of the state and the counties. It was provided that one-third of the cost should be paid by the state and two-thirds by the counties and that the roads should be built under the supervision of the state.

On account of the failure to realize on the sale of state bonds, comparatively little work had been done up to the date of the report except in the surveying of the routes of the several roads in the system. Of the total expenditure, $40,405.17 was used for grading, $4,831.50 for the construction of bridges and culverts and $12,000 for work in the Shoshone Highway District, the division of which is not shown in the report. Most of the money expended was used for work on the Idaho-Pacific Highway—the principal trunk line—which has a total length of about 800 miles. The work on this road was done in Bannock, Twin Falls, Gooding, Elmore, Ada and Canyon Counties. Other work was done on the Idaho-Montana Highway in Bannock County, on the Yellowstone Park Highway in Madison County and on the Sawtooth Park Highway in Blaine and Lincoln Counties.

NEWS NOTES

Centre Township, Chatham County, North Carolina, has voted $50,000 in road bonds. The issue carried by a vote of 187 to 41. The work will be done by contract.

Paving Bonds to the Amount of $120,000 have recently been voted in the city of Macon, Ga. The proceeds of the bonds will be used for paying the city's third of the cost of paving several miles of streets.

Contracts for Work Amounting to About $125,000 have recently been awarded by the Board of County Supervisors of Milwaukee County, Wisconsin. The work includes both concrete and asphalt paving.

California State Highway Bonds to the amount of $1,000,000 have recently been sold by State Treasurer Richardson to six counties. The counties securing bonds and the amount going to each were as follows: Humboldt, $150,000; Imperial, $100,000; Kings, $50,000; Monterery, $250,000; San Diego, $200,000; Ventura, $250,000. Another sale of about the same amount of bonds is to be made in the near future.

COMING MEETING

April 19.—Oklahoma Good Roads Federation.—Meeting at Oklahoma City, Okla. Secretary, Alfred Hare, Oklahoma City, Okla.

May 10-14.—Montana Society of Engineers.—Annual Convention, Butte, Mont.

June 1-3.—Conference of Mayors and Other City Officials of the State of New York.—Sixth Annual Meeting, Troy, N. Y. Secretary, William P. Capes, 105 East 22nd St., New York, N. Y.

August 2-6.—Tri-State Good Roads Association.—Third Annual Convention, San Francisco, Cal.

MEETINGS

Officers of the Florada State Good Roads Association

On the closing day of the annual convention of the Florida State Good Roads Association, which, as noted in "Good Roads" for April 3, was held at St. Petersburg, Fla., on March 24 and 25, the following were elected officers for the coming year:

President, F. O. Miller, Jacksonville; Secretary, J. P. Clarkson, Jacksonville; Treasurer, J. D. Rooney.

Short Course in Highway Engineering at Springfield, Illinois

A short course in highway engineering for the county superintendents of highways of Illinois was held at the Leland Hotel, Springfield, Ill., March 30 to April 2.

The first day of the meeting was set aside for the use of the county superintendents, in accordance with the tentative program, which was noted in "Good Roads" for March 27. These officials formed a permanent organization designated as the Illinois Association of County Superintendents of Highways and elected the following County Superintendents of Highways as officers: President, R. W. Osborn, Livingston County; Vice President, P. B. Wilson, Williamson County; Secretary-Treasurer, W. E. Emery, Peoria County; Directors: E. L. Gates, Du Page County; Alex. Anderson, Ogle County; E. F. Motsinger, Fulton County; Edwin White, Sangamon County; George C. Fairclo, Champaign County; D. O. Thomas, St. Clair County; George H. Brown, White County.

The evening of Tuesday, March 30, was given up to a smoker.

The school of instruction conducted by the State Highway Commission commenced on Wednesday, March 31. Chairman A. D. Gash of the State Highway Commission delivered the address of welcome, and was followed by Chief State Highway Engineer W. W. Marr, who spoke on "The Relation Between Superintendents of Highways and the State Highway Department." The sessions on Wednesday afternoon, Thursday forenoon and afternoon and Friday forenoon and afternoon were devoted to addresses and discussions on various phases of road work. Those taking part included Assistant Chief State Highway Engineer P. C. McArdle; Road Engineer H. E. Bilger, Bridge Engineer Clifford Older, Assistant Engineers B. H. Piepmeier and G. F. Burch and Testing Engineer F. L. Roman of the State Highway Department; several of the division engineers of the Illinois State Highway Department, and a number of county superintendents of highways.

On the evening of Wednesday, March 31, Professor Ira O. Baker of the Civil Engineering Department of the University of Illinois lectured upon the work of the county superintendents of highways, and on the evening of Thursday, April 1, an address was made by Jesse Taylor, President of the Ohio Good Roards Federation.

PERSONAL NOTES

John A. Jones has been reappointed City Engineer of Lewiston, Me.

T. W. Earle has been appointed Superintendent of Streets of Rutland, Vt.

William Stekleberg has been appointed Assistant State Engineer of Nebraska.

G. E. Johnson, of Falls City, Neb., has been appointed State Engineer of Nebraska, to succeed D. D. Price.

A. C. Grover, President of the Vermont Society of Engineers, has been appointed City Engineer of Rutland, Vt.

E. Gibson, for the past six years Assistant City Engineer of Topeka, Kan., has been selected Paving Engineer of the city of Roswell, N. M.

Former Senator W. A. Alsdorf, of Newark, Ohio, has been elected Secretary of the Ohio Good Roads Federation, to succeed A. H. Huston, resigned.

M. T. Williams, T. M. Bland and James M. Garner have been elected a committee of three to have charge of the work of road building under the $50,000 bond issue recently voted in Centre Township, Chatham County, North Carolina.

NEWS OF THE TRADE

The Highway Engineering Co., of Albany, N. Y., has been incorporated under the laws of New York with a capital of $5,000. The company will engage in highway construction. The directors are Walter J. Campbell, of Cohoes, and Mildred B. and Joseph P. Scanlon, of Delmar.

"New Pavements for Old" is the title of a pamphlet recently issued by the Barber Asphalt Paving Co., Philadelphia, Pa. The pamphlet, which is 6 by 9 ins. in size and consists of 8 pages, deals with the resurfacing of worn-out pavements with asphaltic wearing surfaces. After pointing out that it is a waste to throw away the investment represented by old pavements, it describes briefly the correct method to follow in resurfacing work. The pamphlet is illustrated by four excellent halftones, showing work of the nature described and is attractively gotten up.

"Blazing the Trail to Better Roads" is the title of a 16-page road machinery catalogue recently issued by the Good Roads Machinery Co., Inc., of Kennett Square, Pa. The contents of the catalogue include illustrated descriptions of the Champion, Buckeye, Little Winner and National Hercules reversible road machines, the Champion rock crusher, the Champion portable crushing outfit, the Monarch road roller, the company's combination steam roller and traction engine, the Monarch traction engine, the Monarch tandem roller, the Monarch and Climax distributors, pouring pots, heating kettles, wheeled scrapers, plows and corrugated and cast iron culvert. The catalogue is 10½ by 7 ins. and is printed in two colors.

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Road Legislation in Arkansas

A general law recently passed by the Arkansas General Assembly provides for the formation of road improvement districts in that state. It is expected that this legislation will greatly stimulate road construction which, heretofore, has had to depend upon a series of special acts which covered only a few counties and were generally regarded as unsatisfactory.

Briefly, the act provides that, on petition of a majority of landowners in the locality to be benefited, the County Court shall establish road improvement districts to embrace certain definitely described regions, and shall appoint three property owners in each district to serve as a board of commissioners. These commissioners shall receive per diem compensation and shall have power to contract for all road work. They are also empowered to issue bonds to an amount not exceeding 30 per cent. of the assessed valuation of the property in the district, to be paid at maturity out of funds raised by assessment on the property benefited.

The commissioners may call upon the State Highway Engineer to prepare plans, estimates and specifications, or may have this work done by some other engineer, subject to the approval of the State Highway Engineer. On completion of this preliminary work, the County Court is required to appoint three owners of real estate to constitute a board of assessors for the assessment of the property to be benefited, whether such property lies within the limits of the district or not. The assessors are allowed per diem compensation.

A reassessment may be ordered by the Board of Commissioners not oftener than once a year, but if the district shall have issued bonds or other interest bearing evidence of the debt, the assessment may not be diminished. All assessments shall be paid in successive annual installments, so graded that no local assessment in any one year shall exceed 20 per cent. of the benefits assessed against the property involved. The usual penalties are provided for nonpayment of assessments. Funds received from all sources under the act may be deposited with the County Treasurer, subject to the order of the commissioners, or the latter may select a bank to act as depository, in which case all funds deposited are to draw interest at a rate of not less than 3 per cent.

If the tax first levied shall prove insufficient to complete the improvements ordered, the County Court shall, on application of the commissioners, order another levy, within prescribed limits. It is required that the Board of Commissioners shall advertise for bids on all contracts involving expenditures exceeding $1,000.

On completion of the work, all roads constructed under the act are to be turned over to the county in which they are located, to become part of the general highways. On acceptance by the county, the revenues derived under this act may be supplemented by a specific allowance from the general funds of the county, or out of a 3-mill state road tax now authorized by law, such allowance to be used for maintenance. Should the immediate raising of funds for maintenance become necessary, the commissioners are empowered to issue additional bonds to an amount not exceeding 20 per cent. of the assessed valuation of the property in the district, on petition of a majority of the property owners. These bonds shall not be for a longer period than 15 years, while the bonds issued for construction work may run for 30 years.

Contracts Awarded for State Highway Work in Ohio

State Highway Commissioner Clinton Cowen, of Ohio, recently awarded contracts for the construction and resurfacing of 38.7 miles of state highways at a cost exceeding $500,000. The awards include 12.81 miles of macadam, 11 miles of brick, 7.47 miles of concrete and 7.42 miles of resurfacing. The successful bidders were as follows:

Allen County, 0.48 mile, brick, Michael O'Brien, Lima, O., $10,440; Champaign County, 1 mile, K. E. Kunkle, Dayton, $10,473; Clarke County, 2.87 miles water bound macadam, Robbins & McDaniel, Springfield, $25,966; Erie County, 4.56 miles concrete, Fred R. Jones Co., Cleveland, $70,107.52; Fayette County, 0.16 mile brick, John A. Van Gunder, Columbus, $2,847.50; Hancock County, 1.02 miles water bound macadam, Sousley & Britton, Findlay, $7,874; Huron County, 1.07 miles concrete, G. E. Scott, Norwalk, $10,430; Lake County, 4.69 miles brick, A. E. Freshwater, Chester, W. Va., $117,990; Montgomery County, 1.48 miles brick, Ellsworth Brentlinger, Dayton, $28,882; Paulding County, 1 mile water bound macadam, Erie Stone Co., Van Wert, $8,929; 1.025 miles water bound macadam, R. C. Roach, Waterville, $6,900;

Sandusky County, 2 miles water bound macadam, Modern Construction Co., $16,400; Shelby County, 1.78 miles water bound macadam, Hamilton & Bunger, Piqua, $16,997; Tuscarawas County, 1.2 miles brick, Holmes Construction Co., Millersburg, $20,800; 1 mile brick, Yount & Jackson, Dayton, $18,979.35; 2 miles brick, Springer & Rogers, New Philadelphia, $32,433.18; Warren County, 2.15 miles water bound macadam, Ironton Transfer & Storage Co., Ironton, $16,500; Williams County, 1.03 miles concrete, Kelly Construction Co., Bryan, $9,395; Franklin County, resurfacing 7.42 miles of National Pike west of Columbus, W. O. Jewett, Columbus, $18,990; Richland County, 0.74 mile Mansfield-Galion Road, concrete, F. L. Rice, Shelby, $13,323.

April 20 to be "Good Roads Day" in Illinois

Tuesday, April 20, will be observed as "Good Roads Day" in Illinois, in accordance with a proclamation which has been issued by Governor E. F. Dunne. The proclamation is, in part, as follows:

"Again it becomes my pleasure, as well as my duty, to call the attention of the people of the state of Illinois to the question of the need of improving our public highways.

"The advancement made under the new road law during the last year has been pronounced when we take into consideration that the constitutionality of the law was tested in the courts, necessitating delay until the court of last resort could definitely determine that question. The people are to be congratulated that the Legislature did its part of the work so well that the supreme court sustained every section of the law by a unanimous decision. We can now move forward with the work of making better roads with steadiness and in a systematic manner.

"The need for better highways is so pressing that every citizen, highway official and good roads organization should participate in some way in the active work. With this end in view, I have deemed it wise again to set aside a day to be known as "Road Day," upon which all of our citizens should be invited to devote their time to actual road construction, such as grading, draining, dragging, hauling, placing earth, gravel, stone and other materials.

"I recommend also that a good roads program be arranged in each of the schools of the state, which program should embrace the reading of this proclamation, together with such other good roads literature as is deemed appropriate, and, insofar as it is possible, to have a good roads address delivered by someone who is competent to talk upon the subject of constructing and maintaining our public highways."

Highway Work in California

Thirty-six miles of state highway have been authorized by the State Highway Commission of California and bids for the work will be received on April 26. Units will be constructed in three counties, and on completion of the contracts the state highway will extend along the coast practically all the way from San Francisco to San Diego.

The construction authorized includes 24.3 miles in Monterey County, connecting the Santa Cruz County highway with that of San Luis Obispo County. This work will be let in three contracts, the first embracing 6.1 miles between Salinas and Lagunita, the second 7.3 miles from a point 3.2 miles north of Kings City bridge to Greenfield, and the third from a point 3 miles northwest of Bradley to San Ardo, a distance of about 10.9 miles.

In Sonoma County the work includes 6.4 miles from Willow Brook to the southerly boundary of the county and in Contra Costa County, 5.3 miles will be constructed between Richmond and Pindle.

Report on the Road School at the Ohio State University

A report on the winter course in highway engineering given at the Ohio State University during the past winter has recently been made to C. E. Sherman, head of the Department of Civil Engineering, by Frank H. Eno, Professor of Municipal Engineering, who has charge of the work in highway engineering in the department.

The course was held from Jan. 25 to Feb. 6, inclusive, 1915. The total registration in the course was 131, these men representing 40 of the counties in the state. Of the total enrollment, 47 men were county or city engineers or civil engineers in private practice, 32 were street or road superintendents or inspectors, 12 were county commissioners or township trustees, 18 were contractors or material men and 22 were classified as farmers, students and men of other occupations.

Of the 31 speakers on the program only five of those originally provided for failed to appear, and for these other speakers were secured. The attendance and interest were well sustained throughout the course, the regular attendance at the lectures ranging from 45 to 60. There was one evening lecture.

The total cost of the course was practically $800, this including honorariums for paid speakers, traveling expenses of speakers, the services of a stenographer for six weeks prior to the course, printing, and miscellaneous expenses.

Professor Eno's report praises the State Highway Department of Ohio very highly for its cooperation with the university authorities in making the school a success.

Recommendations for next year's school are made by Professor Eno as follows:

"1. That it be given as this year, between semesters.

"2. That a special stenographer and clerk be employed for at least 3 months previous to and during the school.

"3. That the school be begun on Tuesday and closed on the Friday evening eleven days after.

"4. That no moving pictures be arranged for.

"5. That material and machinery firms be not given a place on the program.

"6. That no exhibition be attempted next year except of such materials as the department has in its museum.

"7. That the State Highway Department be freely consulted in preparing the program."

A Road Bond Issue Amounting to $100,000 has recently been voted in Rockcastle County, Kentucky. The issue carried by a vote of 2,229 to 519.

The County Board of St. Louis County, Minn., has added $30,000 to the road improvement funds of the Sixth Commissioner District. The total allotment is now $80,000.

A Bill Appropriating $187,771.42 to the Pennsylvania State Highway Department has been signed by Governor Brumbaugh. The money consists of the unappropriated balance of the automobile license funds.

Canadian Asphalt is to be Tried on the Streets of Edmonton, Alta. The asphalt comes from Northern Alberta and is the subject of a recent report issued by the Dominion Department of Mines.

Plans for Part No. 2 of the Pavilion-Batavia Road through the town of Bethany, N. Y., have been approved by the Board of Supervisors of Genesee County, N. Y. This section of the road covers 4.59 miles.

The San Bernardino County, Cal., Supervisors have ordered paving to cost the county between $40,000 and $50,000. The work will be done in incorporated cities and most of it will connect with the county highway system. In all about 5½ miles will be paved with concrete or macadam in the cities of Chino, Colton, Ontario and Upland. This is in addition to about $40,000 worth of work already ordered within the corporate limits of Rialto and Upland.

Street Work in Council Bluffs, Iowa.

Public improvements involving the expenditure of $180,217 have been contracted for in Council Bluffs, Ia., and the work is to be started at once. With the exception of a few small items, all of the contracts were let in September, 1914, but the work was delayed on acount of the approach of cold weather.

The contracts call for 6 miles of paving, nearly 9 miles of sidewalk and several miles of curbing and gutters. The first of the paving will be done on East Broadway.

Wm. D. Uhler Appointed Chief Engineer of the Pennsylvania Highway Department

William D. Uhler, formerly Principal Assistant in the Bureau of Highways and Street Cleaning, Philadelphia, Pa., has been appointed Chief Engineer of the Pennsylvania State Highway Department by Governor Brumbaugh and has entered upon the duties of that office.

Mr. Uhler has been in the Bureau of Highways and Street Cleaning of Philadelphia since the reorganization of that bureau was undertaken by Chief William H. Connell about three years ago, coming to that city from Maryland. Mr. Uhler, who will succeed Samuel D. Foster, resigned, will receive a salary of $7,000 a year as against $4,000 received in his former position in Philadelphia.

Lower Bids for Paving Work Obtained in Milwaukee, Wisconsin

Contracts have been awarded for the paving with asphalt, of portions of ten streets in Milwaukee, Wis., at a cost of about $120,000. The accepted bids ranged from $1.59 to $1.70 per sq. yd., according to the character of the work, and represented a reduction of from 10 to 20 cts. per sq. yd. from prices paid for similar work a year ago.

The streets to be paved are 16th St., Concordia Ave. to Finn Place; 20th Ave., Greenfield Ave. to Mitchell St.; Royal Place, Prospect Ave. to Farwell Ave.; Irving Place, Farwell Ave. to Cambridge Ave.; Greenfield Ave., 26th Ave. to Trowbridge Ave.; Harrison Ave., 10th Ave. to American Ave.; Cleveland Ave., 10th Ave. to American Ave.; 49th St., Vliet St. to Washington Blvd.; Newport Ave., Summit Ave. to Shepard Ave., and 6th Ave., Greenfield Ave. to Mitchell Street.

NEWS NOTES

Red Oak, Ia., Has Contracted for 34 Blocks of asphaltic concrete paving at an approximate cost of $50,000.

An Issue of $125,000 of Road Bonds was voted at a recent special election in Nicholas County, Kentucky. The vote was "yes" 1,438 and "no" 248.

Tuscaloosa, Ala., Will Observe April 19 as "Good Roads Day," following the custom inaugurated a year ago by the Tuscaloosa County Good Roads Association.

The City Commission of Dayton, Ohio, has authorized a bond issue of $28,000. Of the total, $16,000 will be used for the purchase of equipment for the street department. Included in the equipment to be purchased is a motor street flusher for use on the paved streets of the city.

The Board of Supervisors of Wyoming County, New York, has approved plans for the Bennington-Attica-Attica Center road, which will be 7 miles long and will cost approximately $98,000. The board also adopted plans for the proposed Castile Village county highway. This is to extend 1.59 miles from the north end of the village the entire length of the main street and is to cost $29,000.

Road and Bridge Bonds of the Zolfo District, DeSoto County, Florida, have recently been sold to a Chicago buyer, and $100,000 is to be available shortly.

Contracts for Street Work Amounting to $150,000 have recently been awarded in Kansas City, Kan. The work is included in 32 contracts for paving and curbing.

The Issuance of $40,000 in Bonds in the town of Fairfield, Cal., is being considered. The bonds, if voted, are to be used for the improvement of the streets of the town.

The City of Harrisburg, Pa., has recently purchased a site for an asphalt plant at 9th and Shanois Sts. The site was purchased from the Henry McCormick estate for $6,630.

At a Recent Election in Anderson County, South Carolina, a bond issue of $750,000 was defeated by a large majority. The bonds were intended to provide funds for road improvement.

A Total of About $225,000 is to be Expended for Street Paving in the City of Tulsa, Okla., this year according to recent reports. In addition, about $16,000 will be spent for alley paving.

A Bond Issue of $350,000 for the Use of the Street Repair Department has recently been authorized by the City Council of Cincinnati, Ohio. The bonds will run for 5 years and bear interest at 4½ per cent.

Twenty-one Persons were Killed by Automobiles on the Streets of New York City during the month of March, according to the National Highways Protective Society. During March, 1914, 12 people were killed by automobiles on the streets of the city. In addition to the fatalities due to automobiles, 4 people were killed by trolleys and 5 by wagons during March of this year, thus making the total number of fatalities by automobiles, trolleys and wagons 30, as against 27 in March of last year. The number of people killed on the streets and highways of the state, outside of New York City, during March, was 13, 9 of whom were killed by automobiles, 2 by trolleys and 2 by wagons. The corresponding figures for March, 1914, were 2 by automobiles, 4 by trolleys and 1 by wagon.

PERSONAL NOTES

Homer Hamilton has resigned as City Engineer of Los Angeles, Cal.

Smith Mandigo has been elected Road Commissioner of Highland Falls, N. Y.

G. A. Durkee has been appointed Street Commissioner of Clifton Springs, N. Y.

E. K. Coe has been reappointed County Highway Engineer for the First, Second and Third Districts of St. Louis County, Minn.

E. A. Bonney has been appointed Consulting Engineer to the New York State Highway Department to succeed George A. Ricker, resigned.

H. L. Bowlby has resigned as State Highway Engineer of Oregon, but will be retained by the state in charge of work in Hood River County.

A. E. Dyer, County Surveyor, has been appointed County Highway Engineer for the Fourth, Sixth and Seventh Districts of St. Louis County, Minn.

J. P. Beck has resigned as Publicity Manager of the Universal Portland Cement Co., of Chicago, Ill. Mr. Beck has been with the company for eight years.

Robert J. Cunningham, County Controller of Allegheny County, Pennsylvania, has been appointed State Highway Commissioner of Pennsylvania to succeed E. M. Bigelow, resigned.

Charles A. Snyder has been appointed Street Commissioner of Herkimer, N. Y.

W. N. Maddox of Espanola, Fla., has been appointed Road Commissioner of St. Johns County.

E. I. Cantine has been appointed State Highway Engineer of Oregon, succeeding H. L. Bowlby, resigned.

H. M. Sharp has been appointed Construction Deputy in the office of the Ohio State Highway Commissioner. He was formerly connected with the Kelly Construction Co., of Bryan, O.

William E. Maher, a contractor of Philadelphia, Pa., died recently at the Presbyterian Hospital in that city. He was acting Chief of Highways under the administration of Mayor Weaver.

William H. Boeh has recently been appointed County Surveyor of Hamilton County, O. He was formerly Chief Deputy County Surveyor under Clinton Cowen, recently appointed State Highway Commissioner.

Former State Highway Commissioner James R. Marker of Ohio, whose resignation was noted in "Good Roads" for April 3, has accepted a position as Chief Engineer of the Ohio Paving Brick Manufacturers' Association.

Albert F. Schweizer, formerly Inspector of Construction on Asphalt Pavements in the Public Works Department of Syracuse, N. Y., has been placed in charge of the municipal asphalt repair plant for the present season.

Robert F. Hall, who has been connected with the Sales Department of the Universal Portland Cement Co., of Chicago, Ill., for several years, has been made Publicity Manager of that company to succeed J. P. Beck, resigned.

NEWS OF THE TRADE

The Interstate Construction Co. has recently been incorporated under the laws of Delaware. The company has a capital stock of $10,000 and will engage in general road and paving construction. The incorporators are W. E. Carter, George H. Grant and Christian W. Haigh, of Philadelphia, Pa.

The Uniform Asphalt Distributor Co., of Meridian, Miss., has been incorporated under the laws of Mississippi, with a capital of $15,000. N. V. Hendricks, James Lapthorn and C. C. Dunn are the incorporators. The company's charter provides that it may manufacture and sell road appliances and engage in highway construction.

"Symons Disk Crushers" is the title of a 24-page booklet, 7 by 9 ins. in size, which comprises Section R of the fourth edition of the general catalogue of Chalmers & Williams, Inc., of Chicago Heights, Ill. The catalogue is devoted to a description of the Symons disk crusher, a list of parts and a description of the operation of the machine. It is profusely illustrated by halftones showing the complete machine and sectional views of the machine and a reproduction of a drawing showing side and end elevations and a foundation plan.

"On the Job" is the title of an attractive booklet recently issued by the Watson Wagon Co., of Canastota, N. Y. The booklet contains 32 pages and is 7¾ by 10½ ins. in size. Almost every page is devoted to excellent half-tone illustrations showing Watson wagons or trailers in use in highway work. There are also several pictures showing scenes in and around the Watson plant. The booklet is printed in two colors with a buff-colored cover printed in red, brown and blue.

An appeal from a judgment awarded last winter by the Supreme Court of New York in a lawsuit involving the laying of bitulithic pavement has recently been denied by the Appellate Division of the Supreme Court of New York. The judgment, which was appealed, was rendered in Monroe County on Dec. 2, 1914, in the case of Whitmore, Rauber & Vicinus, of Rochester, vs. the City of Richester and Thos. Holohan, a contractor, the defendants being awarded a judgment against the plaintiff, Whitmore, Rauber & Vicinus. The suit was occasioned by the awarding of a contract for laying bitulithic pavement on a portion of Culver Road in Rochester to Thos. Holohan. A taxpayers' action was instituted by Whitmore, Rauber & Vincinus seeking an injunction to restrain the City of Rochester and the contractor from executing the contract. This action was decided in favor of the defendants on Oct. 19, 1914. Later, on Dec. 2 as previously noted, a judgment was entered in favor of the defendants. An appeal was taken by the plaintiff, with the result already noted. An item noting the action of the court in dissolving the injunction, and stating briefly the nature of the case was printed in "Good Roads" for Nov. 21, 1914. It was contended by the plaintiffs that the action of the city in awarding a contract for bitulithic was contrary to law. The court held that the awarding of the contract was lawful and that although the charter provides that any "particular kind, make, style or brand of material" may not be designated, bitulithic could be specified as it is a separate basic material and not a "particular kind, make, style or brand of material."

COMING MEETING

April 19.—Oklahoma Good Roads Federation.—Meeting at Oklahoma City, Okla. Secretary, Alfred Hare, Oklahoma City, Okla.

May 10-14.—Montana Society of Engineers.—Annual Convention, Butte, Mont.

June 1-3.—Conference of Mayors and Other City Officials of the State of New York.—Sixth Annual Meeting, Troy, N. Y. Secretary, William P. Capes, 105 East 22nd St., New York, N. Y.

June 22-26—American Society for Testing Materials.—Annual meeting, Atlantic City, N. J. Secretary, Edgar Marburg, University of Pennsylvania, Philadelphia, Pa.

August 2-6.—Tri-State Good Roads Association.—Third Annual Convention, San Francisco, Cal.

At a recent meeting of the Board of Directors of the Northwestern Road Congress it was voted to hold the 1915 meeting at Minneapolis, Minn., Cedar Rapids, Ia., or Peoria, Ill. President Cooley, Vice President Hazelwood and Secretary Keenan were appointed a committee to select the meeting place from the three cities named.

In connection with the sixth annual meeting of the New York State Conference of Mayors and Other City Officials at Troy, N. Y., June 1-3, there will be an exhibition of the implements and manufactured wares used and purchased by municipalities. The exhibition will be held in the drill shed of the Armory and will be in charge of a local committee which has been appointed by Mayor Burns of Troy. It is also planned to have moving pictures of various municipal activities shown in connection with the exhibits. The Secretary of the committee is C. R. Metzger, General Secretary of the Troy Chamber of Commerce.

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Notice to discontinue subscription should be sent to the New York office.

Copy for advertisements of which proofs are to be submitted to advertisers should reach the New York office as follows: For insertion in the first issue of the month, by the fifteenth of the preceding month; for other issues, by noon on Thursday of the week before date of issue.

Copy for all advertisements of which proofs need not be submitted—including "Proposal," "For Sale," "Want" and other classified advertisements—will be accepted until noon on Thursday of the week of issue.

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Brick Roads Under Construction in Orange County, Florida

Orange County, Florida, has under construction at present, five brick roads having a total length of 57 miles. The cost of the work will be $525,000. It is expected that the entire system will be completed by December 1.

The work has been let in three sections, the Southern Paving & Construction Co., of Chattanooga, Tenn., having 31 miles, while the Alabama Paving Co., of Birmingham, Ala., and the R. M. Hudson Co., of Atlanta, Ga., have 13 miles each.

May 6 to Be "Road Day" in Virginia

Governor Henry C. Stuart of Virginia has recently issued a proclamation setting aside May 6 as "Road Day" in that state. In his proclamation, Governor Stuart said:

"In compliance with a joint resolution of the General Assembly, adopted at its session in 1914, requesting the Governor to designate by proclamation each year one day in the month of May to be known as Road Day, I do hereby proclaim Thursday, May 6, 1915, to be known and observed by the people of Virginia as Road Day.

"All citizens are urged to assist in working the public highways of the state on said day. Labor and materials contributed should be under the management of the road boards or supervisors directly in charge, to the end that there may be no waste or duplication of effort.

"Loyal support for this movement is earnestly to be desired, for far above the value of contributions will be the spirit awakened in behalf of better roads and the object lesson that will be placed before all the people of the state."

Operation of the Ohio State Brick Plant at Junction City

According to a report received from the Ohio Board of Administration there are at present about 2,000,000 paving blocks ready for shipment at the state brick plant at Junction City.

The brick plant was leased from the Junction City Clay Products Co. about a year ago and remodelled for state use. Since it was put in operation, from 50 to 80 convicts have been at work, and this force, it is expected, will be increased as soon as the weather conditions permit. The plant is in charge of a superintendent and two practical kiln burners who act as guards. The remainder of the labor is supplied by the penitentiary, the convicts being maintained by the state and paid a small daily wage.

Apportionment of State Aid Funds in Kentucky

The State of Kentucky has raised by taxation nearly $660,000 for road work during the current year. The funds have been apportioned to the counties in the state in proportion to the amount levied in each, but in no case will any county receive more than 2 per cent. of the entire fund. The apportionments are not to be sent direct to the counties, but each county will pay its own bills within the limit set, and will afterward be reimbursed by the state.

The amounts apportioned to the various counties are as follows: Adair, $3,249; Allen, $3,443; Anderson, $7,885; Ballard, $7,780; Barren, $5,899; Bath, $5,664; Bell, $8,671; Boone, $9,426; Bourbon, $13,164; Boyd, $9,603; Boyle, $10,265; Bracken, $6,026; Breckenridge, $5,000; Bullitt, $2,500; Butler, $3,296; Caldwell, $1,750; Calloway, $4,928; Campbell, $13,164; Carlisle, $4,055; Carroll, $5,000; Carter, $3,760 Casey, $4,330; Christian, $13,164; Clark, $13,164; Clinton, $2,656; Daviess, $13,164; Edmonson, $2,585; Elliott, $2,402; Estill, $2,809; Fayette, $13,164; Fleming, $3,000; Floyd, $1,500; Franklin, $8,742; Fulton, $5,815; Gallatin, $1,000; Garrard, $8,346; Grant, $10,301; Graves, $13,164; Grayson, $4,558; Greenup, $9,419; Hancock, $2,000; Hardin, $8,520; Harrison, $8,340; Hart, $7,040; Henry, $7,156; Hickman, $3,902; Hopkins, $10,829; Taylor, $2,000; Trimble, $3,443; Warren, $12,644; Wayne, $3,570; Whitley, $7,141; Jefferson, $13,164; Jessamine, $9,378; Johnson, $2,009; Kenton, $13,164; Knox, $4,078; Knott, $1,000; LaRue, $3,641; Laurel, $3,710; Lawrence, $4,434; Leslie, $1,000; Letcher, $5,861; Lewis, $4,700; Lincoln, $9,075; Livingstone, $3,477; Logan, $7,733; Lyon, $3,434; Madison, $12,461; Magoffin, $2,000; Marion, $6,616; Marshall, $4,000; Martin, $775; Mason, $13,164; McCracken, $13,164; McLean, $3,552; McCreary, $2,727; Meade, $4,004; Menifee, $2,404; Mercer, $9,189; Monroe, $4,176; Montgomery, $6,000; Muhlenburg, $7,317; Nelson, $13,164; Nicholas, $6,237; Ohio, $8,837; Oldham, $5,000; Owen, $4,732; Pendleton, $3,500; Powell, $2,333; Pulaski, $8,044; Robertson $1,000; Rockcastle, $3,533; Rowan, $2,000; Russell, $2,478; Scott, $9,266; Shelby, 13,164; Simpson, $7,251; Spencer, $2,967; Todd, $6,265; Trigg, $669; Union, $10,677; Washington, $2,491; Webster, $6,000; Woodford, $11,966.

Street Records for Public Information in San Diego, California

City Engineer W. M. Rumsey of San Diego, Cal., has devised a system of records which enable taxpayers and others who may be interested to see at a glance the exact status of all street improvements in the city.

After each meeting of the City Council, a clerk in the office of the City Engineer goes over the proceedings and posts up the record. In this way an accurate and current account is available, showing in detail the course of all street work.

A sample of the record designed by City Engineer Rumsey, is reproduced below.

Between ....line of ....and..............line of..........................
Between ....line of ....and..............line of..........................
Between ....line of ....and..............line of..........................
Between ....line of ....and..............line of..........................
Between ....line of ....and..............line of..........................
Between ....line of ....and..............line of..........................

Work to be done: Grading—Paving—Curbs—Gutters—Sidewalks.

PROCEEDINGS	Date	Remarks
Petition received by Council..........	....	....
Engineer directed to report elevations. Resolution No..........	....	....
Cross-sectioned by	....	....
Profile made by..........	....	....
Elevations reported to Council..........	....	....
Grade established. Ordinance No..........	....	....
Petition to change grade received..........	....	....
Engineer directed to report on new elevations. Resolution No..........	....	....
New Elevations reported to Council..........	....	....
Grade changed	....	....
Bet................line of.......................and........line of..........	....	....
And bet...........line of.......................and........line of..........	....	....
Petition received to grade by private contract..........	....	Granted-Denied
Resolution No......ordering plans, yardage, etc..........	....	....
Plans made by..........	....	....
Yardage computed by	....	....
Assessment Plat made by	....	....
Assessment Plat approved by Council..........	....	....
Resolution of Intention No....... Passed..........	....	....
Property holders notified by card..........	....	....
Street Posted	....	....
*Publication of posting	....	....
Protest received	....	....
Hearing set—protest	....	Sustained-Denied
Resolution ordering work No....... passed..........	....	....
Notice inviting sealed proposals	....	....
Bids received	....	....
Bids reported	....	....
Notice of award of contract to..........	....	....
Posting of award of contract	....	....
Contract signed	....	....
Cut and fill stakes set by..........	....	....
Finish stakes set by	....	....
Checked by	....	....
Accepted	....	....
Resolution No....... asking for Assessment Diagram..........	....	....
Assessment Diagram sent to Council..........	....	....
Assessment Diagram accepted	....	....
Protest on assessment and diagram..........	....	....
Notice of hearing	....	Sustained-Denied
*New Assessment Diagram called for..........	....	....
New Assessment Diagram sent to Council..........	....	....
New Assessment Diagram accepted..........	....	....
Assessment Roll issued	....	....
Protest on Assessment Roll	....	....
New Assessment Roll ordered	....	....
New Assessment Roll	....	....
Bidders 1.......... 4..........	....	....
2.......... 5..........	....	....
3.......... 6..........	....	....
Approximate cost per front ft..........	....	....
†Certificates to Owners Issued	....	....

---

*Omitted when done by private contract.
†Refers to grading done by private contract.

Funds for Philippine Road Work

According to a report issued by the Department of Commerce, the Governor General of the Philippines has released $750,000 for general road and bridge work throughout the islands. In addition to this sum, $176,500 has been released for the following projects:

Maintenance Banger-Tagudin Road, $2,500; maintenance Calamba-Bigaa Road, $40,000; maintenance Baloe-Cuyapa Road, Nueva Ecija Province, $25,000; maintenance Vigan-South Road, $17,000; maintenance Zapote-Bacoor Road, $17,000; San Pablo-Nacarlang Road, Laguna Province, $12,500; San Fernando-South Road, Pampanga Province, $25,000; Victoria-Manapla Road, Occidental Negros, $25,000; for any project in Tarlac Province to be selected by the officials of the Bureau of Public Works, $12,500. This item, it is expected, will be spent on the projected road between Victoria in Tarlac and San Juan de Guimba in Nueva Ecija Province.

There is available for road and bridge work in the Philippines, according to the same report, the sum of $900,000 in addition to a continuing appropriation of $250,000 subject to release by the Governor General. It is estimated that these funds will equal in amount the funds released for public works in 1910-11, the year of the greatest public improvements in the islands.

At a Recent Election in Hickman County, Kentucky, a road bond issue of $200,000 was defeated by a majority of about 125. It is reported that another election will probably be held in a few months.

The St. Louis, Mo., Municipal Assembly has passed a bill appropriating $1,360,000 of the $2,750,000 free bridge additional bond issue, to purchase material for completing the eastern approach to the new bridge.

A Bond Issue of $2,000,000 is being advocated by the Chamber of Commerce of Imperial County, California, for the construction of a 200-mile highway system in the Imperial Valley. The sum which it is proposed to raise represents the entire bonding capacity of the county.

Report on the Work of the Wisconsin Highway Commission

The second biennial report of the Wisconsin Highway Commission, covering operations during the two calendar years ending December 31, 1914, has recently been published. It contains much information of general interest. Inasmuch as the commission has been in existence only three and a half years, its first report was necessarily somewhat incomplete and the present document gives in detail the actions of the board since its inception.

During the life of the commission there have been constructed roads and bridges costing over $8,870,000 at an average cost for state supervision of about 2 1-3 per cent. The cost of this supervision is paid out of the general funds of the several counties and the state, leaving the amount levied for road or bridge construction free to be used solely for that purpose.

APPLICATIONS FOR STATE AID AND ALLOTMENTS FROM STATE HIGHWAY FUND FOR CONSTRUCTION.

Year	Applied for	Allotted
1912	$ 451,317	$ 348,696
1913	830,000	830,000
1914	1,558,840	1,236,057
1915	1,212,134	1,212,134
Total	$4,052,291	$3,626,887

MILEAGE OF SURVEYS MADE AND COMPLETED PLANS MAILED FOR FISCAL YEARS SHOWN, INCLUDING 182.39 MILES NOT PAID FOR OUT OF COMMISSION'S MAINTENANCE FUND.

Year	Surveys made	Plans mailed
1912*	547.24	379.87
1913†	944.64	936.75
1914‡	1,257.06	1,210.19
Total	2,748.94	2,526.81

*Prior to July 1, 1912.
†July 1, 1912 to July 1, 1913.
‡July 1, 1914 to July 1, 1914.

BRIDGE SURVEYS MADE AND BRIDGE PLANS SENT OUT DURING FISCAL YEARS INDICATED. SHOWING BOTH STATE AID AND COUNTY AID WORK.

	State Aid		County Aid	
Year	Surveys	Plans	Surveys	Plans
1911-12	148	91	225	84
1912-13	298	243	254	258
1913-14	308	339	336	362
Total	754	673	815	704

Grand Total.........Surveys, 1,569; Plans, 1,377.

TYPE AND MILEAGE OF STATE AID ROAD CONSTRUCTED FROM 1912 TO 1914, INCLUSIVE, WITH TOTAL COST.

Type		Mileage
Graded and drained		1,271.59
Graded and drained, sand or clay surface		70.05
Permanently surfaced—		
*Stone macadam	742.38	
†Gravel macadam	437.79	
Shale	73.60	
Concrete	87.61	
‡Other surfacing	7.63	
Total permanent surfacing		1,349.01
Total mileage constructed		2,690.65
Total cost of construction		$7,219,850.07

*Includes bituminous macadam.
†Includes mine waste.
‡Sandstone block, brick, asphalt, bituminous concrete.

As the report states, the work of the commission has been remarkable not so much on account of the amount of construction planned and supervised, as in view of the fact that the activities have been divided into so many separate items. Work has been done in each of the 71 counties and in approximately 90 per cent, of the units of government of the state. The report contains many tables, brief summaries of some of which are given here in order to show the amount and character of the work accomplished.

Paving Work in Salt Lake City, Utah

The City Commission of Salt Lake City, Utah, has recently voted $39,100 to cover the city's portion of the cost of the paving work to be done this year.

The appropriation for paving work includes $35,250 for the city's portion of the cost of actual paving work and an additional sum of $3,850 for lowering water mains on some of the streets where paving is to be laid. Among the streets to be paved are the following:

N St., from South Temple to 4th Ave., $4,900; B St., between 3rd and 11th Aves., $7,875; North Temple St., between Main and State Sts., $300; 4th West St., between 1st and 2nd South Sts., $1,400; 9th South St., between Main and States Sts., $2,825; 4th South St., between 5th and 7th East Sts., $2,800; 6th St. East, between 3rd and 5th South Sts., $5,000; 13th East St., between 9th and 12th South Sts., $14,000.

Ward Allotments for Paving Work in Minneapolis, Minnesota

Acting on the recommendation of its paving committee, the City Council of Minneapolis, Minn., has made ward paving allotments aggregating $958,000, with the understanding that not all of the work ordered will be done during the present season.

The various ward allotments and the work already ordered are as follows, according to the committee's report:

Ward	Allotment	Ordered
First	$ 75,000	$ 93,118
Second	35,000	14,685
Third	90,000	41,305
Fourth	63,000	33,582
Fifth	75,000	77,753
Sixth	12,000	12,183
Seventh	40,000	.....
Eighth	65,000	9,334
Ninth	90,000	38,687
Tenth	140,000	42,160
Eleventh	47,000	3,665
Twelfth	186,000	142,296
Thirteenth	40,000	.....
Total	$958,000	$508,768

Paving Projects in St. Paul, Minnesota

The City Council of St. Paul, Minn., has recently decided to pave Lexington Ave., and a portion of the north roadway of Summit Ave., at an estimated cost of $136,912.

Lexington Avenue will be the more important of the two contracts to be let. This thoroughfare will be paved with creosoted wood blocks from Summit Ave. to University Ave., at an estimated cost of $85,000, and with asphaltic concrete from University Ave. to Como Park at an estimated cost of $50,000. Creosoted blocks will be used on Summit Ave., from Snelling Ave. to Brimhall Ave., and the cost is estimated at $1,912.

"Good Roads Day" in Illinois

In "Good Roads" for April 17 it was announced that "Good Roads Day" would be observed in Illinois on April 20, that date having been designated in a proclamation by Governor Dunne. After that issue of "Good Roads" had gone to press, but too late to make the necessary correction, it was learned that the date had been changed to Thursday, April 22.

The Police Jury of Jefferson Davis Parish, La., has appointed a commission to investigate the construction and cost of roads and to report in June. The commission has elected W. F. Teitje chairman.

The City Clerk of Macon, Ga., has been instructed to receive bids for $300,000 worth of bonds recently authorized by the voters of the city. The bonds are in denominations of $1,000 and bear interest at the rate of 4½ per cent. The proceeds are to be used for paving and other public works. Bids will be received up to 7.30 p. m. on April 29.

A 2½-Mile Concrete Motor Speedway is to be built near Detroit, Mich., by a company known as the Detroit Motor Speedway. A contract for the work has been awarded to W. J. McCarthy & Co., of Indianapolis, Ind., who are under bonds to complete the work by August 1. The officers of the company are: President, John B. Whelan; Vice President, S. D. Maddux; Treasurer, Albert Hardenstine; Secretary, Robert B. Swart.

PERSONAL NOTES

H. C. Hawkins has been appointed City Engineer of Oskaloosa, Ia.

J. P. Price has been reappointed City Engineer of Columbia, Mo.

James H. Matthews has been elected Street Commissioner of Albion, N. Y.

L. A. Brady has been appointed City Engineer of San Bernardino, Cal., vice Frank A. Smith, resigned.

E. F. Bridges, former City Engineer of Oskaloosa, Ia., has been made General Manager of the Oskaloosa Paving Brick Co.

R. T. Brown was elected Highway Engineer of Orange County, N. C., at a recent meeting of the County Road Commission.

George S. Iredell, formerly City Engineer of Austin, Tex., has engaged in private practice in that city. He will specialize on municipal work.

Osborne J. Dempster, M. Am. Soc. C. E., City Engineer of Little Falls, N. Y., has resigned to take a position with the New York State Highway Department.

R. M. Clayton, former City Engineer of Atlanta, Ga., has engaged in consulting practice, with offices in the Temple Building, Atlanta. He is specializing on paving, waterworks and sewers.

Geo. I. Oakley, Assoc. M. Am. Soc. C. E., Resident Engineer on the New York State Barge Canal work at Little Falls, N. Y., has been appointed City Engineer of Little Falls to succeed Osborne J. Dempster, resigned.

J. F. Ziglar and G. F. Henshaw have formed the engineering firm of Ziglar & Henshaw, Winston-Salem, N. C. Mr. Ziglar has ben engaged in railway and municipal engineering and Mr. Henshaw recently resigned as City Engineer of Winston-Salem.

Clifford B. Moore, Chief Engineer of the Topographical Bureau, Borough of Queens, New York, N. Y., has been appointed Consulting Engineer of the Borough to succeed the late J. Foster Crowell. Mr. Moore has been in the city service since 1910.

Charles U. Powell, First Assistant Engineer of the Topographical Bureau, Borough of Queens, New York, N. Y., has been placed in temporary charge of the bureau owing to the appointment of Clifford B. Moore as Consulting Engineer of the Borough.

C. D. Schlemmer of Islip, N. Y., has been elected Superintendent of Highways of the Town of Islip. He was for some time connected with the engineering staff of the New York City Board of Water Supply and was also engaged in the Panama Canal work.

L. W. Rundlett, consulting engineer, and C. G. Moore, municipal engineer, have formed the General Engineering Bureau at St. Paul, Minn. Mr. Rundlett was City Engineer and Commissioner of Public Works in St. Paul for 20 years. Mr. Moore was formerly City Engineer of Eau Claire, Wis.

W. Purves Taylor, Assoc. M. Am. Soc. C. E., formerly Assistant Engineer of the Philadelphia Bureau of Highways and Street Cleaning, has been appointed Principal Assistant to succeed William D. Uhler, whose appointment as Chief Engineer of the Pennsylvania State Highway Department was noted in "Good Roads" for April 17.

COMING MEETINGS

April 19.—Oklahoma Good Roads Federation.—Meeting at Oklahoma City, Okla. Secretary, Alfred Hare, Oklahoma City, Okla.

May 10-14.—Montana Society of Engineers.—Annual Convention, Butte, Mont.

June 1-3.—Conference of Mayors and Other City Officials of the State of New York.—Sixth Annual Meeting, Troy, N. Y. Secretary, William P. Capes, 105 East 22nd St., New York, N. Y.

June 7-9—National Conference on City Planning.—Conference, Detroit, Mich. Secretary, Flavel Shurtleff, 19 Congress Street, Boston, Mass.

June 22-26—American Society for Testing Materials.—Annual meeting, Atlantic City, N. J. Secretary, Edgar Marburg, University of Pennsylvania, Philadelphia, Pa.

August 2-6.—Tri-State Good Roads Association.—Third Annual Convention, San Francisco, Cal.

September 13-18—American Road Builders' Association and American Highway Association.—Pan American Road Congress, Oakland, Cal. Secretary, American Road Builders' Association, E. L. Powers, 150 Nassau St., New York, N. Y. Executive Secretary, American Highway Association, I. S. Pennybacker, Colorado Bldg, Washington, D. C.

The Pan-American Road Congress, under the joint auspices of the American Road Builders' Association and the American Highway Association, will be held at Oakland, Cal., during the week of September 13, according to a decision reached by the Executive Committee of the Pan-American Road Congress at a meeting held in New York on April 16. The date has been selected because of the advantageous arrangements that can be made for halls and meeting places, and also because it was felt that this date would enable engineers planning to attend the International Engineering Congress to attend the Pan-American Road Congress as well. The program will include speakers of national and international reputation as experts in road work, and a large number of representative road engineers and others interested in highway improvement is expected from Canada and other countries as well as from the United States. It has been suggested that one day during the week of the congress be set aside by the exposition authorities to be known as the "Pan-American Road Congress Day," and it is believed that this suggestion will be carried out. The arrangements for the congress are in the hands of an executive committee, of which Governor Charles W. Gates of Vermont is Chairman. The other four members of the committee are James H. MacDonald, former State Highway Commissioner of Connecticut; Major W. W. Crosby, former Chief Engineer of the Maryland State Roads Commission; J. E. Pennybacker, Chief, Division of Economics, U. S. Office of Public Roads, and E. L. Powers, Editor, "Good Roads."

Road Work to Cost $115,000 is being done in St. Charles Parish, Louisiana.

An Election has been Called on the matter of a bond issue of $250,000 for good roads in Dickson County, Florida.

The County Commissioners of Pinellas County, Fla., have petitioned the Legislature for permission to issue time warrants to the amount of $100,000 for road construction.

The City Council of Wilmington, Del., is considering a bond issue of $500,000 for street work. In order that work may be started at once, the council has appropriated $21,650.

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ROAD BUILDING EQUIPMENT

Considerable space is given in this issue to data on the use of motor trucks in highway work, the object being to show, first, the cost of work with such equipment and, second, the advantages of utilizing the equipment best adapted to the work to be performed.

The motor truck, although very useful in highway work and sometimes a large factor in the economical execution of contracts, is only a unit in the equipment required by the modern road contractor. During the past few years road contracting has grown from a business requiring comparatively little capital and a limited plant to a business often calling for large capital and elaborate equipment, the cost of that equipment, according to one road contractor, being enormously large in proportion to the amount of work done yearly. While a road contract once required little equipment other than hand tools, a few dump carts and perhaps a road machine, many contracts now are executed by contractors whose plant for the work comprises steam shovels, motor trucks, industrial railways, mixers, road rollers, stone crushers and other machinery requiring a considerable outlay of capital either for its purchase or rental.

On large work or on work presenting peculiar difficulties or performed under unusual conditions, the contractor's profits and the satisfactory completion of the job depend to no small extent upon the suitability of the equipment used. It is well understood that not all work demands elaborate equipment and that in many cases the simplest and least expensive will prove the most economical and efficient. On the other hand, there is much work on which what may seem a very large initial outlay for machinery and tools will be justified by the saving which it makes possible, or where the expense of renting an industrial railway outfit will be justified by the rapidity or the low cost, or both, of performing the work.

Because of the necessity for reducing to the lowest possible figure the cost of performing his work—if he is to be successful—and the influence that the selection of proper equipment has on reducing costs, the modern road contractor must be thoroughly informed as to what is available in the way of machinery and tools. He must not only be familiar with the equipment in common use but must also keep abreast of the developments in machinery and must be informed as to the cost of operating machines of different kinds. His most valuable sources of information on machinery and prices are the technical publications covering his field, and the literature gotten out by manufacturers.

This is a phase of the work of the technical journal to which "Good Roads" pays particular attention. It is our purpose to put before the contractors who read the publication all of the information along these lines which we can obtain, not only through special articles such as those appearing in this issue but by means of descriptions of new machinery and appliances which are published in almost every issue and through notices of the literature gotten out by manufacturers of the machinery and tools used in road building.

THE ENGINEER AND THE CONTRACTOR

During the past few years there has been no little discussion at road conventions and in the technical press upon the relation between the engineer and the contractor, the object of it having been to bring the engineer and the contractor into better accord.

The relation between these two is often marred by a more or less pronounced mutual distrust. The engineer is sometimes too conscious of his authority and prone to carry it to the limit, if not to exceed it. The contractor is occasionally inclined to look upon the engineer as an interloper and to regard him as a natural enemy.

This situation is aggravated by the usual specifications, in which so much is stipulated to be done in a manner "satisfactory to the engineer." It is right that the engineer, as the representative of the authority for whom the work is being done, should be the judge of the acceptability of the work; but this does not necessarily imply the right to pass upon every detail of the methods followed in achieving the result specified. In other words, instead of attempting to lay down rules for every minute detail of the operations involved, the specifications should describe explicitly the result to be obtained, giving the contractor the greatest possible latitude in the selection and application of methods.

The writing of specifications in accordance with this principle would go far toward bringing about more harmonious relations between the two agents directly concerned with the execution of road and other public work contracts. And there are other very good reasons for writing specifications in this way. The competent contractor knows how to do his work. As a rule he knows more about it than the engineer does—just as the engineer knows more than the contractor does about work that is strictly engineering. The engineer having made the plans and drawn the specifications, the contractor is called in to perform the work, and to perform it in accordance with the specifications and to the best of his ability. While it is proper that the specifications should stipulate that certain general methods shall be followed, it is not proper to specify minute details. The contractor spends time and money acquiring certain knowledge, just as the engineer does, and it is only right that he be allowed to use the skill that he has gained. In fact, it should be held that the contract price includes payment for that special knowledge, just as the engineer's remuneration is largely for his ability in a particular line.

STANDARD SUBSTRUCTURE LOCATIONS

A proposed plan for standardizing substructure locations in the Borough of Queens, New York City, is outlined briefly elsewhere in this issue. Whether or not the plan is adopted, it represents an attempt to solve one of the troublesome problems confronting street officials in cities, and is, therefore, of interest to those who are engaged in city or town work.

The location of subsurface structures is a troublesome matter even in small places where water and gas pipes, and perhaps sewers, are the only things that have to be considered. It is a matter of much more importance in a large city where, in addition to water pipes, gas pipes and sewers, there are also conduits to accommodate telephone and other electric wires, pneumatic tubes, steam mains and the like. The problem is complicated still more when there are street railway tracks on the surface of the street, and, in a few cases, subways. When these substructures are placed in the streets, one after another, without reference to any plan, each city department or public utility corporation places its own structures where most convenient, with the result that each operation is carried out under greater difficulties and at greater expense than the one preceding, and the final result is a jumble of structures difficult in some cases to locate and often difficult of access. As a consequence, the making of necessary repairs or alterations necessitates tearing up large street areas, the work takes longer than it should and the cost is excessive. In addition, street improvements, especially if they be so extensive as to involve widening or any considerable amount of grading, sometime necessitate expensive and troublesome rearrangement of the subsurface structures.

A procedure similar to that proposed in Queens would be of benefit to all parties interested—to the public service corporations in making it easy to locate and uncover their structures for the making of repairs or alterations and in reducing the expense of such work, and to the city in simplifying the planning of improvements and in reducing the number of pavement openings which it is necessary to make. The latter consideration is particularly important—is perhaps sufficient to justify the standardization of substructure locations were the other reasons for such action not taken into account. If, in addition to the standardization of the locations, the structures could be built before the opening of the street, one of the most expensive phases of pavement maintenance in cities—that of repairing openings—would be reduced to the minimum.

The Board of Freeholders of Passaic County, N. J., recently awarded contracts for road materials involving an expenditure of about $100,000.

Long Beach, Cal., is to Spend $250,000 on three important street improvement projects which will add about 6 miles to the city's boulevard system.

An Election to Vote on Issuing $300,000 in Bonds will be held in Hopkins County, Kentucky, on May 29, the date having been changed from May 8. The issue is being advocated by the Hopkins County Good Roads Association, which was organized at a recent meeting at Madisonville.

Nearly $500,000 was Expended by the City of Houston, Tex., for Bridge Work during the past fiscal year. The work included the construction of a concrete bridge at San Jacinto St., at a cost of $154,848.06; a reinforced concrete bridge on Capitol Ave., at a cost of $164,332.28; a reinforced concrete bridge at Franklin Ave., at a cost of $130,000; a reinforced concrete bridge at Preston Ave., at a cost of $38,507.09; a reinforced concrete bridge at Taylor St., at a cost of $20,056.79, and a steel bridge on Hill St., at a cost of $26,991.53.

The Board of Supervisors of La Salle County, Illinois, has appropriated $27,000 to be expended with a similar amount allotted to the county from state funds. At a meeting of the Board of Supervisors held last fall it was voted not to take the necessary steps to secure state aid, the vote at that time standing 31 to 13 in favor of the majority report of the state aid roads committee of the board. At that time it was proposed to appropriate $35,000 from the county to meet an equal appropriation from the state.

The Common Council of Rochester, N. Y., has recently adopted an ordinance directing the Commissioner of Public Works to take over the work of street sweeping, cleaning and flushing. This work has formerly been done by contract, but hereafter will be done by day labor employed directly by the Department of Public Works. Contracts for about $100,000 worth of work have been awarded this year, but it is stated that these will be abrogated. The estimated total cost of the work for this year is about $200,000.

Street Improvement Costing About $150,000 Will be Completed in the City of Madison, Wis., during the present year, it is reported. The work includes the completion of contracts awarded in 1914, which involve an expenditure of about $75,000. In addition, there is new work planned which calls for the expenditure of about $125,000, but not all of this will be completed during the year. Since 1910 the total cost of so-called permanent street improvements has amounted to about $1,622,000, of which approximately $1,006,000 was assessed against property benefited, the remainder being paid by the city. Since 1910, 44½ miles of pavement have been laid.

The Utilization of the Motor Truck in Highway Work

Haulage problems arising in the prosecution of road and street work by contractors and others—like other problems in highway work—differ in details and must be solved by careful study of the conditions peculiar to each particular case. The best method in one instance may not be applicable to another piece of work, nor will the equipment best suited to the requirements of one contract be usable and economical under the conditions prevailing on another job. The efficiency and economy of any work, either by contract or otherwise, depend to a greater or less extent upon the equipment used, and since the part of the work which may be designated under the general head of haulage is so large a factor in most highway work the presentation of data on this item is felt to be worth while.

With this end in view, "Good Roads" has printed annually during the past few years an article embodying data on mechanical traction, this including motor trucks, either with or without trailers, motor-driven flushers and distributors, and similar machines. The motor truck is a comparatively recent addition to the equipment of the contractor, and while its suitability and cost of operation are not such as to warrant the prediction, at this time at least, that it will ever supersede the horse or mule in road work it has replaced animal traction in many instances and is steadily growing in favor. A bare statement to the effect that mechanical traction is the cheaper can not, of course, be made, but the evidence of many who have used both methods of hauling warrants the statement that under certain conditions work can be performed better and cheaper with motor trucks than with horses.

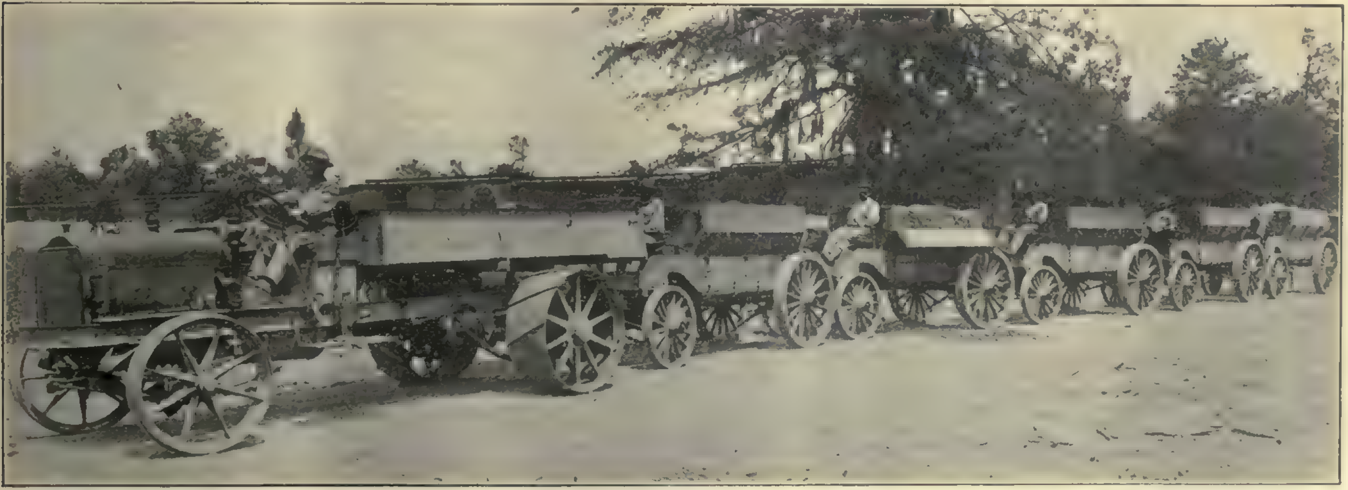
As was pointed out in an article on this subject printed in "Good Roads" for May 2, 1914, actual data on the operation of motor apparatus in highway work are difficult to obtain, for the reason that although almost all contractors who have used such equipment willingly testify that they have reduced their hauling costs thereby they are not willing to make public detailed figures. Others whose continued use of motor trucks indicates that they are convinced of their economy are unable to give figures on the actual cost because their methods of record keeping and accounting do not show the true figures.

The attitude of the first class—those who decline to furnish detailed data—is well illustrated by a reply made by one of them to a motor truck manufacturer who asked for data. This was printed in the article previously referred to, but is worth repetition as an example. It follows:

"I have spent my money to buy motor trucks; I took all the chances and I am ready to say to anyone that your motor trucks are successful for our work and are better than horses—so much so that I am adding to my equipment and will not go back to horses. When you ask me for operating costs you might as well ask me for my costs on everything else in connection with the work, and this you have no right to do—neither has any other contractor. It cost me my own money to get the figures and let the other fellow do the same."

It is impossible to deny the right of a contractor to keep such figures to himself, for he is engaged in a highly competitive business. On the other hand, it is extremely doubtful that the publication of the actual costs in such work would be in any way detrimental to his business.

As a result of this condition, those who endeavor to collect data are obliged to secure much of the information wanted from manufacturers of motor trucks who, in some instances, are successful in securing valuable data from those to whom they sell equipment. In addition, there is, of course, considerable information available from the records of road authorities who have utilized motor equipment in the prosecution of work by force account. In the article last year, to which reference has already been made, the figures presented were grouped under three heads, as follows: Manufacturers' costs, road and street authorities' costs, and contractors' costs. The data presented in the following pages have been secured from similar sources as were those presented last year, although the same system of grouping has not been followed.


MOTOR TRUCK AND TRAILERS USED FOR HAULING ROAD BUILDING MATERIALS IN CHATHAM COUNTY, GA.—WHITE TRUCK AND WATSON TRAILERS.

One of the principal uses of the motor truck and that which naturally first suggests itself is for hauling material, either in the construction of cuts and fills or in bringing to the work materials like stone, gravel, sand, cement and paving blocks, which have to be brought from a source of supply at some distance from the job. Such work will be considered first.

In Coahoma County, Mississippi, a White truck has been used for hauling gravel for road surfacing work. A brief reference to this work was made in the article printed on these pages a year ago, the data being contained in a statement made by County Road Superintendent W. S. Cook under date of December 9, 1913. Since that report was made, more detailed information has been received. The haul on this work was 5 miles and the cost, with teams, was $1.50

DUMPING ROAD METAL FROM A MOTOR TRUCK USED IN ROAD WORK—MACK TRUCK.

DUMP BODY TRUCK USED IN HIGHWAY MAINTENANCE WORK—PIERCE-ARROW TRUCK.

per cu. yd. The truck did the same amount of work as had been performed by from 36 to 40 mules and, with a trailer, work equal to that done by from 48 to 60 mules. At the same time the cost of hauling was reduced to 35 cts. per cu. yd.

On work in the same county the truck was used for hauling wet, heavy Tishomingo gravel from a car to a dumping point 3 miles distant, each load consisting of 4½ yards of gravel. Table I is a record of a typical day's work with the truck.

TABLE I.—RECORD OF TYPICAL DAY'S WORK WITH WHITE TRUCK IN COAHOMA COUNTY, MISS.

	Arrived	Left	Time Stopped	Time Running	Time Trip
At gravel car	10:23	10:25	2 min.	..	
" dump	10:48½	10:53	4½ "	23½	
" gravel car	11:10	11:13½	3½ "	17	47 min.
" dump	11:49	11:54	5 "	35½	
" gravel car	12:18-1:46*	1:49	3 "	24	68 "
" dump	2:13	2:17	4 "	24	
" gravel car	2:39	2:43	4 "	22	53 "
" dump	3:05	3:10	5 "	22	
" gravel car	3.30	3:36	6 "	20	51 "
" dump	3:58½	4:01	2½ "	22½	
" gravel car	4:25½	4:30	4½ "	24½	55½ "
" dump	4:51	4.54	3 "	21	
" gravel car	5:17	5:21	4 "	23	51½ "
" dump	5.43	5:47	4 "	22	
" gravel car	6:11	...	.. "	24	54 "
Elapsed time (10:23 a. m. to 6:11 p. m)			7 hours	48 minutes	
Running time			5 "	25 "	
Stops			0 "	55 "	
Trip time			6 "	20 "	

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*Noon.

In this county, Coahoma, there were hauled during the period from June 12, 1913, to May 9, 1914, the following amounts:

From Dickerson's switch:			
5,052.5 yds.	4¾	miles	23,999.4 yd.-miles
From Sessions switch:			
4,531.0 yds.	1	mile	4,531.0 "
From Old Mill switch:			
3,537.0 yds.	1	mile	3,537.0 "
Total amount hauled			32,067.4 yd.-miles
Total cost			$2,322.52
Cost per yd.-mile			$0.0724

The records of the county authorities show that the $2,322.52 given above as the total cost, included $1,128 paid to the driver of the truck and $1,194.52 for all gasoline, oil, repair work and garage charges.

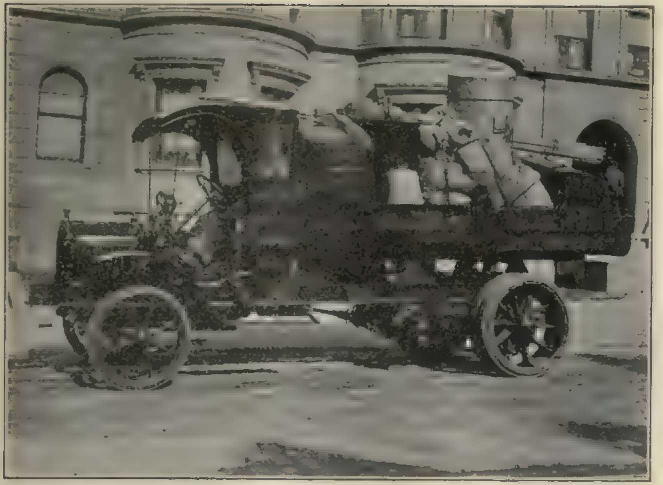
In Noxubee County, Mississippi, the prevailing cost of hauling gravel for road work was $1.70 per ton when the haul did not exceed 6 miles. On a job involving the hauling of 448 tons of gravel from cars at Brooksville to a job 6 miles distant a White truck was used and the work performed in 10 days at a cost of $235.17. At the prevailing prices for hauling, the same work with mules would have cost $761.60. The costs for the truck were as follows:

376 gals. gasoline at 19 cts.	$71.44
36½ gals. of oil	13.86
Grease	2.70
Negro labor at $1.50-$1.75	84.67
Driver	62.50
Total	$235.17

In a hauling test conducted in Volusia County, Florida, Periwinkle shells were hauled for road surfacing, the length of haul being 1.08 miles each way. A total of 430 tons or 573 cu. yds. of material was moved, the truck doing the work in 8 days. The actual running time, however, was only 28 hours, the time consumed in loading and other

TRUCK WITH DUMP BODY USED IN ROAD WORK BY CONTRACTOR—PACKARD TRUCK.

MOTOR TRUCK USED TO DELIVER ASPHALT MIXTURE ON CITY STREET WORK—WHITE TRUCK.



TRUCK USED FOR CARRYING MATERIALS AND EQUIPMENT FOR PAVING WORK—WHITE TRUCK.

POWER DUMP TRUCK USED FOR HAULING ROAD AND SIMILAR MATERIALS—FEDERAL TRUCK.

losses amounting to 61 hours. The total cost of operation was $71.80, which is equivalent to $0.167 per ton; $0.1546 per ton-mile; $0.125 per yd., and $0.116 per yd.-mile.

In a test conducted by the Commissioners of Chatham County, Georgia, a White truck was used for hauling 4,023 tons of Augusta gravel, weighing 2,700 lbs. per cu. yd. The test lasted 45 days and the results were as follows:

Length of haul (miles)	1.15
Total number of tons	4,023
Total number of miles	1,662.5
Miles per gallon of gasoline	1.5
Miles per gallon of oil	23
Total cost of operation	$459.52
Cost per ton	0.114
Cost per ton-mile	0.0993
Cost per yard	0.1542
Cost per yard-mile	0.1340

Between September 1 and December 1, 1914, a Gramm-Bernstein 5-ton truck was used by the Finch Engineering Co., of Bowling Green, Ohio, for hauling crushed stone on a road improvement job. The average haul was about four miles, three of which was over water bound macadam road and the balance over clay in some cases and sand in others. The following table shows the company's statement of costs:

Gross earnings, based on team wage per day		$38.82
Gasoline and oil expense per day	$3.34	
Repairs per day	.29	
Garage storage per day	.20	
Engineer per day	3.00	
Tires per day	3.95	
Total expense		$10.78
Total net earning		$28.04

Among the users who have stated that the use of the truck is economical but who do not furnish detailed data are the Brooklyn Alcatraz Asphalt Co., of Brooklyn, N. Y., the Cleveland Macadam Co., of Cleveland, Ohio, and the Warren Bros. Co., of Boston, Mass. Each of these companies operates White trucks.

The Brooklyn Alcatraz Asphalt Co. has a fleet of nine 5-ton trucks with power dumping bodies which are used for transporting paving materials such as sand, stone, asphalt and other binders. According to Patrick F. Kelly, Treasurer and Superintendent of the company, the fleet saves the firm $125 a day. The nine trucks replace 30 two-horse teams, with drivers and stablemen. Mr. Kelly is further quoted as follows: "On a 6-mile haul from our plant to Bay Ridge, each truck makes nine loads a day, which is six more than a team of horses could make."

The Cleveland Macadam Co. reports that it has used automobile trucks for three years in handling slag, stone and sand and has done away entirely with horses and wagons as the trucks are found to be superior in every way.

The Warren Bros. Co. operates a fleet of 6 trucks, and has found that each truck does the work of three and sometimes four 2-horse teams. When trailers are used, the trucks do the work of five or six teams. Another advantage which this company has found in the use of motor trucks is in increasing the length of haul which can be made under the conditions obtaining in their work. When using teams, the haul was limited to about 10 miles, being usually less than 7 miles. With the motor trucks this has been very largely increased, in one case a contract having been executed at a distance of 38 miles.

TRUCKS WITH DUMP BODIES EMPLOYED IN ROAD CONTRACT WORK—GRAMM-BERNSTEIN TRUCKS.

TRUCK WITH DUMP BODY USED TO TRANSPORT ROAD METAL—G. M. C. TRUCK.

TABLE II. RECORD OF SIX MOTOR TRUCKS OPERATED BY THE ROWE CONTRACTING CO., BOSTON, MASS., DELIVERING BROKEN STONE FROM FEBRUARY 1, 1914, TO JANUARY 31, 1915.

Truck Number Make	One Packard.	Five Peerless.	Six Packard.	Seven Packard.	Eight Alco.	Nine Packard.
Rated capacity	3 tons	4 tons	3 tons	3 tons	5 tons	4 tons
Bought	7/3/11	3/19/13	3/27/13	3/27/13	7/7/13	10/5/14
Book value 2/1/14	$2,665.00	$3,464.85	$3,260.00	$3,295.10	$3,500.00	$3,974.38
Mileage	8,533	11,564	12,110	11,923	9,323	3,514
Tonnage	6,348	6,519	7,785	8,413	6,881	2,965
Lost service, hours*	795	592	213	276	782	nil
Other causes, hours†	568	508	671	620	467	332
Overtime, hours‡	6.5	34.5	36.5	45	19	3
Gasoline, gals.	2,583	3,282	2,924	3,225	3,035	774
Miles per gal.	3.3	3.52	4.14	3.7	3.07	4.54
Oil, pints	1,532	1,650	1,634	1,419	1,062	388
Miles per pint	5.57	7.0	7.41	8.4	8.77	9.03
Costs:						
Interest at 6%	$159.90	$207.89	$195.60	$197.71	$210.00	$79.48
Insurance§	93.36	88.44	88.44	88.44	92.76	29.48
Garage allowance	120.00	120.00	120.00	120.00	120.00	40.00
Operating:						
(a) Gasoline**	371.46	487.00	426.31	478.82	542.47	105.57
(b) Oil††	61.18	66.00	65.86	56.76	42.48	15.52
(c) Chauffeur's wages	606.85	743.99	743.16	736.35	812.77	239.64
(d) Repairman's wages	182.00	182.00	182.00	182.00	182.00	40.00
(e) Repair and parts	69.06	280.92	235.57	170.28	330.55	1.95
(f) Tires	320.64	735.23	380.69	661.45	453.92	262.75
(g) Incidentals	35.30	38.30	35.30	46.10	41.30	27.88
(h) Depreciation‡‡	426.65	578.20	605.50	596.15	466.15	175.70
Total	$2,446.40	$3,527.97	$3,078.43	$3,334.06	$3,204.40	$1,017.97
Ton-miles	18,737	26,664	27,088	26,604	28,608	7,942
Cost per ton-mile	13.06 cts.	13.23 cts.	11.36 cts.	12.53 cts.	11.20 cts.	12.82 cts.

*Actual time lost through fault of machinery or tires. † Actual time lost through fault of weather, delays in dumping, no orders, holidays, etc. ‡Work done after 6 p. m. §Fire and personal liability. **Charged at ⅛ ct. per gal. more than market price. ††Charged at 4 cts. per gal. more than market price. ‡‡Charged at 5 cts. per mile.

NOTES—Gravity loading from bins, average time 2 minutes. Condition of roads, good all the year round. Overloading: 3-ton trucks frequently overload 50%; 4 and 5-ton trucks 20%. Monahan steel body with hand hoist used on all trucks. All rear wheels equipped with 6-in. dual tires.

TABLE III.—DATA ON HAULING WITH 2-YD. WAGON AND 4-YD. TRUCK.

Haul, R'nd Trip. Miles.	Team or Truck.	Loading Time. Minutes.	Running Time. Minutes.	Unloading Time Minutes.	No. of Trips per 10-hr. day.	No. of Miles per 10-hr. day.	No. of Yard-Miles per 10 h. day.	Total cost per day.	Cost per Yard-Mile (Cents).
1	Team	0.5	20	5	23.5	23.5	23.5	$6.00	25½
	Truck	0.5	6	5	52.2	52.2	104.4	15.15	14½
1½	Team	0.5	30	5	16.9	25.3	25.3	6.00	23½
	Truck	0.5	9	5	41.4	62.1	124.2	16.93	13½
2	Team	0.5	40	5	13.2	26.4	26.4	6.00	22½
	Truck	0.5	12	5	34.3	68.6	137.2	18.10	13
2½	Team	0.5	50	5	10.8	27.0	27.0	6.00	22
	Truck	0.5	15	5	29.3	73.2	146.4	18.93	13
3	Team	0.5	60	5	9.2	27.6	27.6	6.00	21½
	Truck	0.5	18	5	25.5	76.5	153.0	19.52	13
3½	Team	0.5	70	5	7.9	27.7	27.7	6.00	21½
	Truck	0.5	21	5	22.6	79.1	158.2	19.99	12½
4	Team	0.5	80	5	7.0	28.0	28.0	6.00	21½
	Truck	0.5	24	5	20.3	81.2	162.4	20.37	12½
4½	Team	0.5	90	5	6.3	28.3	28.3	6.00	21
	Truck	0.5	27	5	18.5	83.2	166.4	20.73	12½
5	Team	0.5	100	5	5.7	28.5	28.5	6.00	21
	Truck	0.5	30	5	16.9	84.5	169.0	20.96	12½
6	Team	0.5	120	5	4.8	28.8	28.8	6.00	21
	Truck	0.5	36	5	14.5	87.0	174.0	21.41	12½
7	Team	0.5	140	5	4.1	28.7	28.7	6.00	21
	Truck	0.5	42	5	12.6	88.2	176.4	21.63	12½
8	Team	0.5	160	5	3.6	28.8	28.8	6.00	21
	Truck	0.5	48	5	11.2	89.6	179.2	21.88	12

NOTES—Truck cost figured on the following basis: Fixed charges: (1) Investment, Insurance and Garage, $2.25 per day; (2) Driver, $3.50 per day. Total [(1)+(2)], $5.75 per day. Variable charges: Tires, Gasoline, Repairs, Depreciation, etc., $0.18 per mile. Teams figured at $6.00 per day. Speeds: Truck, 10 miles per hour; Team, 3 miles per hour. Working day, 10 hours.

TABLE IV.—COST DATA ON HAULING AND SPREADING BITUMINOUS MATERIALS ON NEW YORK ROADS, BARRETT MFG. CO.

Truck—	5-ton Alco.	5-ton Alco.	5-ton Morgan.	5-ton Morgan.	5-ton Alco.	6½-ton Alco.	6-ton Locomobile.	6-ton Kelly.	6-ton Kelly.
Cost:									
(a) Fuel, Lubrication, etc.	$339.28	$229.09	$286.90	$254.59	$688.36	$290.57	$242.32	$158.47	$161.34
(b) Repairs and Expenses	686.60	817.19	779.57	758.58	1,055.49	1,261.25	602.05	423.98	265.75
(c) Truck Labor	1,119.70	895.60	883.69	970.73	1,349.32	1,077.72	994.64	686.81	689.82
(d) Insurance, Depreciation, License, etc.	1,889.34	1,789.30	1,985.15	1,744.63	1,902.55	2,886.37	2,355.24	835.76	835.81
Total	$4,034.32	$3,731.18	$3,935.31	$3,728.53	$4,995.72	$5,515.91	$4,194.25	$2,105.02	$1,952.72
Mileage	6,604	5,077	5,122	5,400	5,485	5,286	5,483	3,922	3,342
Days Operated	200	167	214	221	189	158	144	90	90
Miles per gal. of fuel	2.97	3.40	2.65	2.97	2.36	2.71	2.96	2.70	2.79
Total cost per mile	0.61	0.73	0.77	0.69	0.91	1.04	0.76	0.54	0.58
Total cost per yard-mile	0.25	0.30	0.31	0.27	0.38	0.35	0.29	0.19	0.22

In Table II is shown the record for one year of six motor trucks operated by the Rowe Contracting Co., of Boston, Mass. These trucks were used exclusively for delivering broken stone to road work and to building work, and although the two kinds of work are not separated it is believed by the company that the costs given in the table will apply equally well to either kind of work.

Table III shows comparative costs of hauling with a 2-yd. dump wagon and with a motor truck with a 4-yd. dump body. This table was made up from two of a set of four printed in a pamphlet issued by the Lee Loader Co., of Chicago, Ill. They were intended, originally, to show the saving in time made by loading with Lee loaders. The four tables were arranged in pairs, one pair showing data on hauling by wagon with and without loaders and the other showing data on hauling by truck with and without loaders. The figures in the table presented here have been taken from the two tables showing data on work with the loaders. The first eight columns in Table III are taken directly from the two tables referred to, while the data in the last three columns have been calculated from the other data on the assumptions given in the notes accompanying the table. These are that the cost of operating the truck is $5.75 per day plus 18 cts. per mile and that the team costs $6 per day. These figures are also taken from the pamphlet referred to. The data given in the pamphlet are based on results obtained from actual operations, it is stated.

TABLE V.—DATA OBTAINED IN A TEST OF A JEFFERY QUAD ON ROAD BUILDING WORK NEAR KENOSHA, WIS.

1.—TRUCK STATEMENT.

Fixed costs, per day.

Interest on investment of $3,350 ($2,750, cost of chassis, plus $600, cost of dump body) at 6 per cent., is $201 a year, which, reckoning 300 working days to the year is, per day	$0.67
Garage rent, dead storage, $10 month, which, reckoning 25 working days to the month, is, per day	0.40
Painting and annual overhaul (excluding running repairs) $150, which, reckoning 300 working days to the year, is, per day	0.50
Insurance and taxes, per year, $180, or per day	0.60
Driver's wages, per day	3.00
Total fixed costs, per day	$5.17

Variable costs, per mile.

Tires, per mile	1.78 cts.
Depreciation of chassis (less tires), assuming life of 7½ years at 65 miles per day is, per mile	1.67 "
Depreciation on dump body (value $600, life 5 years) is, per mile	0.60 "
Gasoline, average 5 miles to the gallon (truck loaded and unloaded), at 15 cents per gallon (to allow for possible tax increases) is, per mile	3.00 "
Oils, waste and grease, per mile	0.40 "
Repairs to truck, per mile	3.00 "
Repairs to dump body, per mile	0.40 "
Total variable cost, per mile	10.85 "

2.—TRAILER STATEMENT.

Fixed costs, per day.

Interest on investment of $1,000 (four Bain 1½-yd. patent dumps at $250 each) at 6 per cent., is $60 a year, which, reckoning 300 working days to the year, is, per day	$0.20
Yard charges for storage, four trailers, at $3 a month each, are $12, which, reckoning 25 working days per month, is, per day	0.48
Painting and annual overhaul (say $60 a year for four of them) amounts, per day, to	0.20
Total fixed costs, per day	$0.88

Variable costs, per mile.

Depreciation on two trailers (two running while two are being loaded), per mile	1.0 cts.
Grease, etc., for two trailers, per mile	0.3 "
Repairs and maintenance, for two trailers, per mile	1.0 "
Total variable costs, per mile	2.3 "

3.—QUAD AND TRAILER STATEMENT.

Total fixed costs, per day.

Quad truck	$5.17
Trailers	0.88
Total	$6.05

Total variable costs, per mile.

Quad truck	10.85 cts.
Trailers	2.30 "
Total	13.15 "

4.—HAULING COSTS WITH QUAD 2-TON TRUCK AND FOUR TRAILERS, TWO WORKING AND TWO AT TEAM TRACK.

No. of trips per day.	Miles per day.	Fixed cost per day.	Running costs at 13.15 cts per mile.	Total cost per day.
5	27.0	$6.05	$3.55	$9.60
6	32.4	6.05	4.26	10.31
7	37.8	6.05	4.97	11.02
8	43.2	6.05	5.68	11.73
9	48.6	6.05	6.39	12.44
10	54.0	6.05	7.10	13.15
11	59.4	6.05	7.81	13.86
12	64.8	6.05	8.52	14.57

5.—COSTS PER YARD AND YARD-MILE OF HAULING GRAVEL BY QUAD TRUCK AND TRAILERS, AS AGAINST $1.00 A YARD BY HORSES.

No. of trips per day.	Total cost per day.	No. of yds.hauled per day.	Cost per yard hauled.	Cost per yard-mile.
5	$9.60	22.5	$0.42	$0.15
6	10.31	27.0	0.38	0.14
7	11.02	31.5	0.35	0.13
8	11.73	36.0	0.32	0.12
9	12.44	40.5	0.30	0.11
10	13.15	45.0	0.29	0.11
11	13.86	49.5	0.28	0.10
12	14.57	54.0	0.27	0.10

6.—GROSS AND NET SAVINGS OF QUAD TRUCK AND TRAILERS OVER TEAMS.

No. of trips per day.	No. of teams for same work.	Cost of operating Quad and trailers.	Cost of hiring teams.	Gross saving of Quad per day over teams.	Horse driver-hours in loading.	Cost of extra loaders for truck and trailers.	Net saving of Quad per day over teams.	No. of working days to retire investment out of profits
5	3¾	$9.60	$22.50	$12.90	7½	$2.00	$10.90	398
6	4½	10.31	26.00	15.69	9	2.00	13.69	317
7	5¼	11.02	31.50	20.48	10½	2.00	18.48	235
8	6	11.73	36.00	24.27	12	4.00	20.27	215
9	6¾	12.44	40.50	28.06	13½	4.00	24.06	181
10	7½	13.15	45.00	31.85	15	4.00	27.85	156
11	8¼	13.86	49.50	35.64	16½	4.00	31.64	138
12	9	14.57	54.00	39.43	18	4.00	35.43	123

Table IV shows data on the operation of nine trucks used by the Barrett Mfg. Co., of New York, N. Y., for hauling and spreading bituminous materials on roads in New York State. The two kinds of work have not been separated, as in most cases the work of spreading was done after hauling the material for some distance and the separation would be a matter of considerable difficulty. The costs given were selected as representing average conditions.

Interesting and instructive data (see Table V.) on the relative cost of hauling by teams and trucks were obtained in a test made under the supervision of the Thomas B. Jeffrey Co., on a road building job near Kenosha, Wis., being done by George Wade, a road contractor. The work consisted of hauling road metal from a siding near the center of the city of Kenosha to a concrete road under construction on Park Ave. The haul was 2.7 miles, the nature of the road over which the hauling was done being as follows:

Kind of Road.	Condition.	Length, miles.
Brick	Good	0.20
Concrete	Good	0.05
Asphalt	Good	0.05
Brick	Good	0.50
Macadam	Fair	0.05
Dirt	Fair	0.05
Loose, sandy dirt	Bad	0.40
Concrete	Excellent	1.35
Sand	Very bad	0.05

The equipment consisted of a Jeffery Quad and four Bain 1½-yd. dump trailers. A portable hopper, shown in one of the accompanying illustrations, had been installed at the

TRUCK BEING LOADED IN HAULING TEST AT KENOSHA, WIS.—JEFFERY QUAD.

siding to prevent congestion at that point. The hopper held 8 cu. yds, and was kept as nearly full as possible. The truck and trailers were loaded directly from this, as shown in the illustration. After handling the equipment in different ways on several trips, it was demonstrated that the best results could be obtained by:

1. Using four trailers, leaving two at the siding to be loaded while the others were being hauled to the work.
2. Hiring enough extra shovelers at the siding to have the hopper and the two extra trailers full when the truck arrived with the empty trailers and to have the two loaded trailers coupled together and ready to be coupled to the truck.
3. By having a team on the job to reverse the trailer wagons after they had been dumped, while the Quad was turning around in the sand at the end of the road.
4. By having the driver of the truck do nothing but drive the truck, leaving to the other men such operations as coupling, uncoupling and dumping the trailers and the truck.

By following this method it was found possible, after making allowances for unavoidable delays, to complete a round trip in 50 minutes, the time being divided as follows:

Time to load Quad	2 min. 0 sec.
Time to pick up loaded trailers	0 min. 45 sec.
Running time to job	22 min. 15 sec.
Time to dump Quad and trailers, turn trailers around, reverse Quad and couple up again...	9 min. 45 sec.
Running time to team track, Quad and trailers empty	15 min. 15 sec.
Total	50 min. 0 sec.

At this rate, it was possible to make 12 round trips per 10-hour day.

TRUCK HAULING SCARIFIER IN FAYETTE COUNTY, KENTUCKY—WHITE TRUCK.

TRUCK AND TRAILERS USED IN A HAULING TEST—JEFFERY QUAD AND BAIN TRAILERS.

Basing the calculations on the results obtained in this test and upon prevailing costs, the figures contained in Table V. were obtained.

William G. Fox, a contractor of Saratoga Springs, N. Y., reports that he is now using three Packard 3-ton trucks in highway work. One truck was purchased in 1912, another in 1913 and another in 1914. During 1912 he operated one truck 18 hours per day, doing the work of 9 teams. The price of the teams was $5 per day each, while the cost of operating the truck 18 hours daily was $12.50, this not including depreciation nor interest on investment. In 1913 he operated two trucks at a daily cost of $15 each, this figure including the cost of overhauling at the end of the season. The cost of operation in 1914 was practically the same as that in 1913, the trucks in both of those years being operated 12 hours per day. On some of the work in 1914 it was necessary to operate the trucks in sand, some of it so light that the machines could not run over it until the roadway had been covered with layers of brush.

One of the accompanying illustrations shows the adaptability of the motor truck to different kinds of road work. In this illustration a Kinney distributor is shown ready to be placed on a Kelly chassis. Trucks are frequently utilized for different kinds of road work by substituting for the ordinary body for hauling material, distributors for applying bituminous material, water sprinkling devices or other special equipment.

On a road construction job where the cost of hauling by teams was 28 cents per yd.-mile a saving of 44.10 cents per day was effected by the utilization of a Peerless 4-ton truck

MOUNTING DISTRIBUTOR ON MOTOR TRUCK CHASSIS—KINNEY DISTRIBUTOR AND KELLY TRUCK.

SNOW REMOVAL IN PHILADELPHIA, PA. — ROAD SCRAPER DRAWN BY A KNOX-MARTIN TRACTOR.

SNOW REMOVAL IN PHILADELPHIA, PA.—SNOW PLOW ON A PEELESS TRUCK.

and a trailer. The work was done by the Dale Engineering Co., of Utica, N. Y., the average haul being 3 miles. With a truck and trailer a load of 9 tons was carried on each trip and 10 trips were made in a working day of 10 hours, making the daily capacity 90 tons or 59 cu. yds. Figuring depreciation at 25 per cent. per year, and tire cost at 7½ cents per mile, the cost per cu. yd.—including the salary of the driver and his helper, the cost of repairs, gasoline and oil—was 14 cents.

In one of the accompanying illustrations is shown a 3½-ton Kelly-Springfield truck, equipped with a hydraulic hoist steel dump body, in use by the road authorities of Harris County, Texas. Three of these trucks and two of the trailers made by the Troy Wagon Works Co. are used by that county in road construction and repair work. Although detailed data on the cost of operation are not yet available, the county authorities report that they are proving satisfactory and that the work they have already done demonstrates that with proper handling they will make possible a very considerable saving.

In a demonstration conducted by the Lee Loader Co., the manufacturer of the Lee loader to which previous reference has been made, interesting data were secured on hauling with a motor truck. The work consisted of delivering sand and gravel to a road job one-half mile distant from the siding where the cars of material were delivered. Four 2-yd. Lee loaders were used to load the truck, 16 men being employed to do the shoveling from the car to the loaders. It is stated that although a less number of men woud have been sufficient to fill the loaders while the truck was delivering the material, the sixteen were employed in order to make certain that the loaders would be filled upon the return of the truck so that there would be no delay in loading. In 8 hours, 64 loads of 4 yds. each were delivered to the work. The average loading time was approximatey 30 seconds and unloading required about the same amount of time, a dump body equipped with a hydraulic hoist being used on the truck. The work was done for the Gary Teaming Co., of Chicago, Ill., who were investigating the question of motor truck hauling.

In a period of 144 days, ending Jan. 15, 1915, the Lee Loader Co. delivered 19,941.7 tons of material with the truck used in the demonstration described in the previous paragraph. During the period, 12 days were lost for holidays or lack of material to deliver, making an average of 150.1 tons per day for the days on which work was performed or 138.4 tons for 144 days. The average trip was about 1½ miles, the total distance traveled 5,728 miles and the average number of loads per day 24. About 75 per cent. of the material hauled was for road building work.

As showing the tendency of municipal and other street authorities to adopt motor trucks, there may be cited the annual report of Robert J. H. Worcester, Superintendent of Roads and Bridges of Concord, Mass., in which the substitution of a motor truck and four trailers for the teams now used by the Road Department of that town is recommended.

According to Superintendent Worcester's report, the problem of transportation is one of vital importance in the operation of the department, as the adoption of the 8-hour

MOTOR TRUCK EQUIPPED WITH DISTRIBUTOR FOR BITUMINOUS MATERIALS—ALCO TRUCK.

TRUCK EQUIPPED WITH DISTRIBUTOR FOR BITUMINOUS MATERIALS—PIERCE-ARROW TRUCK.

USE OF A MOTOR TRUCK FOR HAULING A ROAD GRADER—WHITE TRUCK.

MOTOR TRUCK USED FOR HAULING ROAD BUILDING MATERIALS IN HARRIS CO., TEXAS—KELLY TRUCK.

law, the location of the existing gravel pits, the increased cost of horse sustenance and the slowness of draft horses have all tended to increase the cost of work and reduce the amount that can be done in a given time. As an argument for the adoption of motor truck hauling, Superintendent Worcester submitted the following estimate of the cost of performing work by the two methods, assuming a life of 8 years for both motor outfit and teams:

First cost 4 teams at $700	$ 2,800.00	First cost auto truck	$ 4,000.00
First cost 4 carts at $215	860.00	First cost 4 trailers	1,000.00
First cost 4 harnesses, etc. at $100..	400.00		
	$ 4,060.00		$ 5,000.00
Cost per year of maintaining four teams, and wages of drivers	$ 5,322.00	Cost per year of maintaining truck and trailers including wages of driver	$ 2,500.00
Interest on investment at 6%	240.00	Interest at 6%......	300.00
Depreciation	507.00	Depreciation	625.00
Total annual fixed charges	$ 6,069.00	Total annual fixed charges	$ 3,425.00
Total cost of four teams for 8 years, including first cost	$52,612.00	Total cost for 8 years, including first cost	$32,400.00

Regarding these figures, Superintendent Worcester's report continues as follows:

"The above figures show clearly the great advantage of the auto truck over the horse-drawn vehicle in first cost and maintenance; which, added to the fact that the truck with two trailers can go at least twice as fast over the road as the horses, seems to me to swing the balance conclusively in favor of the auto truck. I figure on four trailers and speak of hauling two, for the reason that it is the custom to have two trailers loading while the truck is away with the other two. In view of the foregoing, I recommend that as the teams now in the service of the department give out, no new ones be purchased, but instead that an auto truck and four trailers be substituted in place of horses. It is necessary that four teams be kept at the barn to do the snow plowing in the winter, as there are eight routes to be taken care of."

A 5-ton Pierce-Arrow truck operated by the Pennsylvania State Highway Department is shown in one of the accompanying illustrations. The truck is shown at work on a section of state highway in Pennsylvania, where the haul is about five miles and on which some of the grades are excessive. The truck makes from four to five round trips, from 40 to 50 miles, each day. The loading is done by 4 shovelers in about 20 minutes.

Besides its use for hauling materials, the motor truck has been found of great utility in drawing road machines such as scrapers, scarifiers and trucks. Several examples of this use of motor trucks are shown in the accompanying illustrations.

One such use is reported from Fayette County, Kentucky, where a White truck was used in a test by the county authorities. The work consisted of operating a scarifier, then a harrow and finally a heavy grader over a section of old stone road. The work was done at a cost very much lower, according to reports, than it could have been done with teams.

In Cabarrus County, North Carolina, a somewhat similar test was made with one of the same kind of trucks. In this work, a 26-mile stretch of road was graded, dragged and rolled, the truck being used for hauling the graders and drags. The total cost for fuel and oil was about $50, and but two men were employed—the driver of the truck and an operator for the road machine.

Similar work has been done in many other places with very considerable reductions in cost as compared to team hauling.

Another important utilization of the motor truck is for distributing oils and other materials used for treating roads and for water sprinkling. In the accompanying illustrations several such uses are shown. A less common use of a motor truck is shown in two illustrations at the top of page 177,

FLEET OF TRUCKS OPERATED BY A PHILADELPHIA PAVING COMPANY—LOCOMOBILE TRUCKS.

MOTOR TRUCK HAULING ROAD DRAG IN WASHINGTON COUNTY, MISS.—WHITE TRUCK.

which are of two trucks used by the City of Philadelphia in snow removal work. In that city in 1914, two trucks were fitted up with snow plows in the manner shown in the illustration of the Peerless truck, and one Knox-Martin tractor was used to haul an ordinary scraper, as shown in the other illustration. These trucks were used in addition to the horse-drawn snow plows and were not assigned to any particular district but were used primarily in sections where the contractors had fallen behind in their work or were late in starting. After they had been used for this, they were employed in opening up some of the more important thoroughfares outside of the general business section of the city. Chief William H. Connell of the Bureau of Highways and Street Cleaning reports that this plan worked satisfactorily and that in one day the following streets were cleaned for the distance and widths shown:

	Length Miles.	Width Ft.
Market St., including City Hall plaza..........	1.9	62
Arch St.	1.0	36
Broad St.	5.5	69

He also states that they will be used more extensively in the future than they were in the past.

In one of the accompanying illustrations is shown a motor truck equipped with a tank and discharging mechanism for water sprinkling. The machine illustrated is an Autocar truck owned by the city of Pensacola, Fla., and used for street sprinkling. According to reports, the machine does the work of three 2-horse sprinkling carts at a very much lower cost. The driver of the car also controls the sprinkling mechanism and, it is stated, can sprinkle one mile of road to a width of 20 ft. in about 4 minutes. The tank and sprinkling mechanism are so attached as to be easily removed from the chassis so that a body for hauling material can be substituted.

UTILIZATION OF THE MOTOR TRUCK FOR STREET SPRINKLING—AUTOCAR CHASSIS.

Proposed Street Work in Des Moines, Iowa

Street work to be done in the city of Des Moines, Ia., during the present year will cost over $500,000, according to recent reports.

The work includes the laying of about 300,000 sq. yds. of paving on 46 streets and avenues, which will probably cost between $500,000 and $600,000. One of the largest jobs will be the opening and paving of Ingersoll Ave., which is already under way. The avenue is to be paved from 17th to 28th Sts., and 17th St., between Ingersoll and Grand Aves., is to be widened. When this is done, the northwestern portion of the city will have a direct route to the business district, which will be wide enough to accommodate the heaviest traffic and is expected to relieve the heavy travel on some of the other streets. Another important improvement in the city is the completion of the 7th St. bridge and viaduct extension, in connection with which paving will be laid which will open a new highway for South Des Moines.

Money Raised for Highways in Oneida County, New York

Agreements between the town superintendents of highways and the town boards of the several towns of Oneida County, N. Y., as to the expenditure of money raised for highway work, have been completed and filed with County Engineer Arthur O'Brien. The law requires that each town shall place at least 10 per cent. of the total amount received in a reserve fund which can be expended only with the approval of the county engineer.

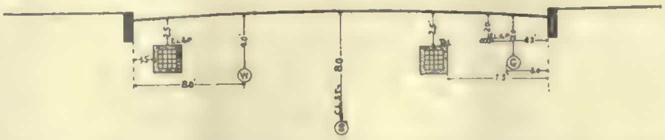
The amounts available in the various towns, together with special appropriations and reserve, are shown in the following table:

Town	Amount Available	Special Appropriations	Reserve Fund
Annsville	$5,053.54	$1,000.00	$3,753.54
Augusta	4,108.58	1,500.00	825.75
Ava	3,296.10	......	2,307.98
Boonville	6,419.68	......	4,662.95
Bridgewater	3,106.67	......	2,384.91
Camden	4,450.00	2,300.00	800.00
Deerfield	3,185.56	785.00	1,080.23
Florence	3,668.43	......	2,381.78
Floyd	3,574.27	850.00	1,782.52
Forestport	4,381.36	......	3,541.30
Kirkland	6,115.25	1,600.00	3,476.25
Lee	4,859.56	1,250.00	1,629.56
Marcy	4,201.90	472.00	421.00
Marshall	4,865.60	575.00	2,485.73
New Hartford	6,105.55	......	4,000.00
Paris	4,515.60	......	3,156.10
Remsen	3,091.16	......	2,307.98
Rome	9,473.55	2,300.00	3,871.65
Sangerfield	2,578.97	......	1,296.97
Steuben	2,835.18	......	1,451.74
Trenton	5,535.37	......	4,251.37
Vernon	11,458.76	7,782.00	1,858.00
Verona	10,592.26	2,400.00	4,144.80
Vienna	6,059.01	3,600.00	689.01
Western	3,400.61	400.00	1,076.21
Westmoreland	5,095.60	2,335.62	1,057.60
Whitestown	5,536.61	1,510.00	4,026.61
Totals	$137,564.73	$31,659.62	$64,721.54

Proposed Substructure Location, Borough of Queens, New York City

Haphazard installation of substructures in streets in the Borough of Queens, New York City, will be done away with if the Board of Estimate and Apportionment approves the plans for standard locations of substructures, which have been prepared by the Substructure Division of the Borough Topographical Bureau, after much study and consultation with various city officials and representatives of public service corporations.

Rejecting the pipe gallery idea as unnecessarily expensive, the bureau decided that the only practical solution of the problem was to assign a definite space or lane within the street limits for each city or public service substructure. This has been worked out in the manner shown in the accompanying diagram.



CROSS SECTION OF STREET, SHOWING PROPOSED SUBSTRUCTURE LOCATION, BOROUGH OF QUEENS, NEW YORK

The lanes in each street will be mapped and their locations will be specific and final, so that each city or public utility substructure may be reached and repaired without difficulty or interference with other lines. This method would greatly cheapen the cost of construction and maintenance and would reduce the number of pavement openings.

The Portable Railway in Highway Construction

With the growth of road contracting from a comparatively small place in the business of general contracting to its present position as an important division of contract work, there has been a corresponding development in the equipment used. This development is well exemplified by the utilization of portable railways in the transportation of materials. Although suited only to jobs of considerable magnitude, such plant is in more or less common use at present.

The portable railway, although an integral part of the entire construction plant, may be considered as composed of three units—the track, the cars and the locomotive. The tract work, there has been a corresponding development size. It may, of course, be laid as the ordinary railroad track with wooden ties to which the rails are spiked. The more common type of track, however, consists of steel rails and ties securely fastened together in sections about 15 ft. long and provided with splices for fastening together the separate sections. Switches, crossovers and sometimes turntables are built in a similar manner and may be readily inserted in the track where desired.

The cars vary in size and construction but are commonly built entirely of steel and arranged to dump to either side. In general, also, the bodies can be lifted from the cars, making the latter available for carrying platform bodies or for other uses. The locomotives may be the usual dinkeys or may be gasoline or electric locomotives, the dinkey being the more common. Several manufacturers make these locomotives, which, as a rule, must be both light and powerful—light because they have to be shipped from one place to another and frequently have to be used on tracks crossing ordinary highway bridges.

The most common use of portable railways in highway work is for transporting from a storage yard such materials as crushed stone, cement, sand, gravel and other materials used for building the foundation and wearing surface of a road. In other cases the railway may be used to carry earth and rock from cuts or borrow pits to fills. The latter use is, of course, confined to long sections of road where there is heavy cutting and filling or to shorter sections so situated that material can be moved from one to another. One of the most common uses of the portable railway is in the construction of roads of varying lengths radiating from a common center where material is obtained, or on a long road at one end of which is the railroad siding, crushing plant, mixing plant or other source of supply. On such work, one locomotive is often used advantageously to haul a train of loaded cars to the work, while other cars are being loaded at the yard or plant. In such cases, there is often a more or less elaborate yard, with sidings, loading devices and coaling and watering facilities.

LOCOMOTIVE HAULING EMPTY DUMP CARS BACK TO THE YARD—PORTABLE RAILWAY USED IN HIGHWAY CONSTRUCTION WORK.

One such yard was established at Judy, a station on the C. T. H. & S. R. R., near the city of Beecher in Will County, Illinois, in connection with the employment of a portable railroad for the construction of a considerable mileage of road in Washington Township. The railroad siding at the yard was about 11 ft. above the portable railway, so that the work of unloading the cars of stone and loading the dump cars on the portable railway was accomplished by gravity. Briefly described, the unloading device consisted of a wooden chute extending from the railroad siding to a point above the portable railroad track. The chute was wide enough to accommodate several railroad cars and was provided with wooden gates. The stone was dumped directly from the railroad cars into the chute, where it remained until the gates were raised and it was discharged to the dump cars. With this chute, two men were able to load twenty-five 1½-yd. dump cars in from 30 to 40

LABORERS CARRYING A SECTION OF THE PORTABLE RAILWAY TRACK.

minutes, which was the average time required for a round trip of the train. An elevated water-tank and coal bin were built just outside the yard so that the locomotive could be coaled and the tank filled with water while the cars were being loaded. There was also a complete blacksmith shop inside the yard, where necessary repairs could be made. In this work a mule was used for switching inside the yard in order to save time—a practice which is very commonly followed in such work.

The train used on this work consisted of from eight to ten 1½-yd. dump cars ahead of the engine and from fourteen to eighteen behind. There were several places on the road where the grade was about 4 per cent., and these limited the train to about 20 cars. It was necessary at these places to uncouple the engine from the rear of the train and send it over the top of the hill with the cars at the front, then go back for the remainder. This, it is stated, required but little extra time and made it possible to deliver from 30 to 40 cu. yds. of stone on each trip, the average haul on the job being a little over two miles. The train crew consisted of an engineer, a head and rear flagman, the head flagman riding on the engine and helping with the firing. The flagmen took care of the dumping of the cars. About 5 minutes was required to dump a train load of from 25 to 30 cars.

The general method of laying the track is, of course, to lay it from the yard or other source of supply toward the work, the track already laid being used by the train hauling the track sections to the place of laying. A gang of four men is sufficient for this work, and it is possible for such a gang to lay and line up 2,000 ft. per day. After a track is built it is customary to keep one man going over it continuously, watching for places needing attention. This, although not always necessary, is generally desirable, as the keeping of the track in the best possible condition adds very greatly to the efficiency of the equipment. In one case in Illinois the ralway after being used for one road was transferred 6 miles overland to another section. This was done by picking up the track in the rear of the train, hauling it ahead and relaying it. The cost of this work was $329.

EMPTY TRAIN STARTING BACK TO THE YARD AFTER DUMPING STONE ON THE ROAD.

The cost data following were obtained on work done near Detroit, Mich., by the County Commissioners of Wayne County, and, it is stated, the work may be taken to represent fair average conditions. The outfit used was furnished by the Orenstein-Arthur Koppel Co., of Koppel, Pa., and consisted of 7 miles of portable track, 60 dump cars, 5 service cars and one 7½-ton locomotive. The equipment was used on two separate roads, the work being done between the latter part of May and the patter part of September of last year.

The costs reported are as follows:

Unloading and laying track	$731.22
Operating expenses	3,660.00
Depreciation at 15% per annum Repairs for one year	3,899.34
	$8,290.56

LOADED TRAIN STARTING FROM YARD AT THE RAILWAY SIDING.

Data on the two jobs, designated as Road "A" and Road "B," are given in the following table:

Road "A":	
Length of haul, 6½ miles; average haul, 3¼ miles.	
Materials hauled:	Tons
Pebbles	12,530
Sand	5,720
Cement	3,060
Total	21,310
Net ton-miles	69,257
Road "B":	
Length of haul, 3 miles; average haul, 1½ miles.	
Materials hauled:	Tons
Pebbles	3,850
Sand	1,716
Cement	936
Total	6,502
Net ton-miles	9,753
Net ton-miles, Road "A"	69,257
Net ton-miles, Road "B"	9,753
	79,010
Total cost	$8,290.56
Resulting net cost per ton-mile	0.105

The City of Dunsmuir, Cal., has recently voted $25,000 in bonds for the construction of a thoroughfare through the city on the route of the state highway. It is reported that a concrete pavement will be put down.

Features of Highway Work in Hawaii

An interesting discussion of the difficulties confronting the road builder in Hawaii was given in a paper presented by H. K. Bishop, M.Am.Soc.C.E., before Section D of the American Association for the Advancement of Science at its annual meeting in December of last year. Mr. Bishop, who was formerly First Deputy of the New York Commission of Highways, was engaged as Chief Engineer of the Hawaii Loan Fund Commission in September, 1911, and served until November of the following year, during which time he was engaged in preparing plans and specifications and superintending the construction of the belt road improvement on the Island of Hawaii. A brief description of road conditions in Hawaii, written by Mr. Bishop, was published in "Good Roads" for May, 1912, under the caption, "Why Our Country Roads Fail." The information in the following pages is taken from the paper previously referred to and the illustrations are from photographs furnished by Mr. Bishop.

ILLUSTRATION NO. 1.—TYPICAL REINFORCED CONCRETE DECK GIRDER BRIDGE IN HAWAII.

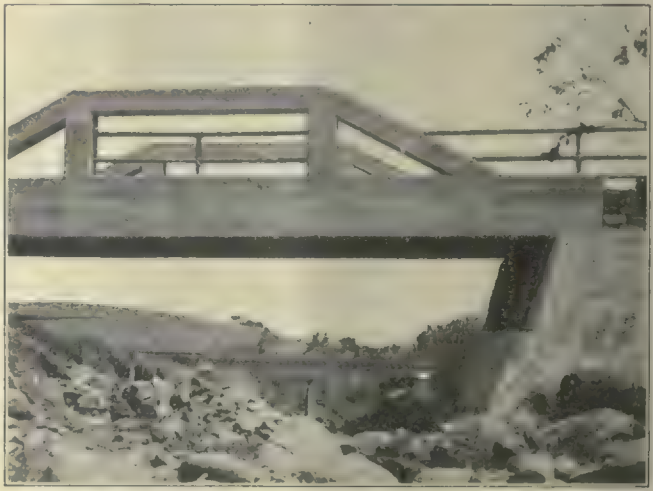


ILLUSTRATION NO. 2.—WEAKENED STEEL BRIDGE INCASED IN CONCRETE—ISLAND OF HAWAII.

The territory of Hawaii comprises a number of islands situated between 18° 54′ and 22° 15′ north latitude, and 154° 50′ and 160° 30′ west longitude. The principal islands are Hawaii, Maui, Molokai, Kauai, Oahu and Niihau. The territory is divided into counties, each of which comprises one or more islands, usually one, and is governed by a board of supervisors, who are elected by the people. The Island of Hawaii has the largest area and the greatest mileage of highways, but is second in point of population, which is 55,382. The Island of Oahu has the greatest population—81,993—and contains Honolulu, the capital of the territory.

All of the islands are of volcanic origin, with some coral rock along the coast. The productive areas are confined to comparatively narrow strips along the coast, in which are situated the most important highways. As a rule, the interiors of the islands are mountainous and unproductive. The prevailing direction of the winds is northeast, and these winds, blowing in from the sea against the high mountains, cause heavy precipitation on the north or windward side of each island, while on the southerly or the leeward side the rainfall is very light. As a result of these conditions, it is difficult to provide proper drainage for the roads on the windward side and extremely difficult to keep water bound macadam in good condition on the leeward side, where the climate is hot and dry. There are no deposits of asphalt or other suitable binding material on the islands, and transportation facilities are usually so poor that the price of imported materials is excessive.

The population of the territory in 1910 was 192,000. Of this total, 42 per cent., or nearly half, were Japanese, about 14 per cent. were Hawaiians, about 12 per cent. were Chinese and about 12 per cent. were Portuguese. The principal labor is Japanese and Portuguese, but the laws of the territory do not permit the employment of oriental races on public work, except where the workmen are eligible to become citizens of Hawaii, i. e., are Hawaiian born. As the Japanese are exceptionally good laborers, public work, and especially road work, is seriously handicapped by this restriction.

In the early days the principal avenues of communication were footpaths and pack trails. Later these were widened to make wagon roads, and still later, with the growth of the sugar industry and the increase of foreign population, the need of better transportation facilities was felt and these wagon roads were surfaced with stone and a disintegrated lava rock called gravel. Before the county system of government was adopted, the central government, through the Superintendent of Public Works, improved many of the highways with first-class water bound macadam, often laid on a telford base. When the county form of government was established the counties took charge of the maintenance of the roads already built and the construction of all new ones, and the results were generally unsatisfactory. In 1910 and 1911 legislative provision was made for the issuance of bonds, the proceeds of which were to be used by the Loan Fund Commission for the improvement of the roads. The appropriation for Hawaii was inadequate to complete a proper system or even to put in good condition the worst parts of the belt line. The taxpayers expected a large mileage of roads to be built with the appropriation. There were no bituminous materials available nearer than California, and the transportation charges made the cost of these very great. In addition to these difficulties, the excessive and continuous rainfall on the windward coast made the application of bituminous materials of doubtful success, and the excessive wash, especially on heavy grades, and the almost sure lack of future maintenance seemed to prohibit the use of water bound macadam.

One of the most serious problems of design was that of providing the proper area of opening for culverts. If the openings were made sufficiently large to provide for the

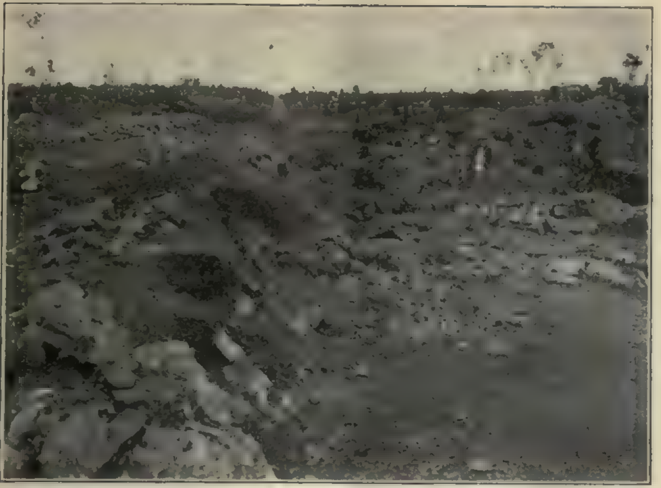


ILLUSTRATION NO. 3.—GRADING IN PROGRESS ON A HAWAIIAN ROAD.

ILLUSTRATION NO. 4.—RETAINING WALL USED ON SMALL FILLS ON HAWAIIAN ROAD.

maximum rainfall the cost of building the necessary structures would be prohibitive, and on account of the lack of accurate maps and the inaccessibility of the contributing territory it was often impossible to ascertain the area of watershed. The numerous gulches crossed by the belt highway on the windward coast were spanned by steel and wooden bridges. It was found on examining these that many of the steel structures were in a weakened condition, due to corrosion, which is very rapid in the Hawaiian climate. On the other hand, the wooden bridges, when covered and protected, were much more durable in addition to being very much cheaper in first cost. In view of these conditions it was decided to build the new bridges of wood in preference to steel. Illustration No. 1 shows a typical reinforced concrete deck girder bridge of 38-ft. span and gives some idea of the excessive waterway it was necessary to provide when bridging some of the comparatively small streams. In time of freshets the entire opening would often be filled. Illustration No. 2 shows a weakened steel bridge, strengthened by incasing it in concrete and providing additional reinforcement where necessary.

The belt road on the Island of Hawaii, which is the main highway of the island, approximately parallels the coast line entirely around the island, a distance of about 250 miles. Beginning at Hilo, a city of about 10,000 population on the northerly side of the island, the highway extends in a southerly direction through the district of Puna, about 30 miles to the active volcano of Kilauea at an elevation of approximately 4,000 ft. above sea level. For a large portion of this distance the road passes through a primitive forest, winding and twisting over lava beds. There are many sharp curves and the grades run as high as 12 per cent. The road is narrow in places and is lined on both sides by tropical trees and dense vegetation. This portion of the road has been straightened and improved from time to time and in many places has been macadamized and is in very good condition. Excessive wash, however, keeps the road surface constantly rough, although on this particular section the drainage is exceptionally good on account of the porous nature of the rocky soil which absorbs the rainfall very quickly.

From the summit a good automobile road leads to the left, descending through open, sandy country and again through dense woods to the floor of the old crater, after reaching which it continues over the rock surface to the present crater. At this point on the road it is possible, without leaving the automobile, to see the molten mass of lava in the crater, and on all sides and even in the road itself are cracks through which steam is constantly ascending. In some of these cracks the heat from the lava below is sufficient to broil steak and heat coffee.

From the summit the belt road continues southwesterly to the sea, part of the way through a barren waste of sandy soil or disintegrated cinder ash. Because of the extremely dry condition of this ash and the lack of fine material for binder it is very difficult to maintain a satisfactory road. During the past two or three years the county has been engaged in building a 20-ft. water bound macadam road through this section, utilizing the labor of convicts from the territorial penitentiary. Illustration No. 3 shows the

ILLUSTRATION NO. 5.—TYPICAL ROAD IN LAVA BED NEAR MAUNA LOA.

ILLUSTRATION NO. 6.—IMPROVEMENT UNDER WAY ON ROAD SHOWN OPPOSITE.

grading for this improvement and a portion of completed road in the background. On account of the scarcity of soil and fine material, a somewhat novel plan has been adopted for obtaining a good grade without excessive costs for fills. Along each side of the road there is built a rough, dry stone wall like that shown in Illustration No. 4. These walls retain the fills, which need be only wide enough to provide the necessary width of roadway.

From this dry, barren section the road continues through the grassy plains of Kau, descending gradually to sea level at Waiohinu. From that place it ascends by gentle curves and steep grades to the portion of the road known as the Kahuku lava flow, which is one of the most interesting sections. It is near the active volcano of Mauna Loa, which from time to time breaks out on the side near the summit, pouring molten lava down the sides of the mountain to the sea. This stream of lava moves very slowly, spreading out fan-like, often to a width of several miles, sometimes covering the highway to a depth of several feet and, of course, necessitating its relocation and reconstruction. Portions of this road have been improved by grading the rock and cinder deposits and in some places by surfacing with cinder ash. Under the action of traffic this is broken and ground up and the finer portions disappear in the underlying strata, leaving the surface in a very rough condition and of an appearance similar to that of a road in which the bottom course has been deposited and then the work stopped.

Illustration No. 5 shows a section of one of the best portions of this part of the road which was selected for improvement under the Loan Fund Commission. There was no water available within 8 miles of the work and no binding material except loam, which could be obtained in limited quantities at one point on the road. As there was very little traffic on this section, the use of loam for binder was fairly successful, but expensive. Inasmuch as the commission was unwilling to spend more than $5,000 a mile on this section, a careful study was made to determine the best treatment that could be applied with the available funds. It was finally decided to improve about 10 miles of the road, surfacing it with macadam with either asphalt or loam as a binder. A contract was awarded for asphalt macadam and very satisfactory results were obtained. The asphalt had to be hauled 18 miles by motor truck. Illustration No. 6 shows the work in progress.

From the Kahuku flow the road passes northerly along the leeward coast through South Kona and North Kona, the most tropical sections of the island. Very limited funds were available at the time the road was built, and as a result it follows the contours and is very crooked, although it has been surfaced with gravel and stone and is in comparatively good condition. The road then passes through the dry section of Keamuku and then to Waimea, a grazing country where the only sign of a highway is the trampled condition of the grass. From Waimea, where the road is at an elevation of 3,500 ft. above sea level, it descends by a more or less winding road with heavy grades of from 6 to 15 per cent., through the Ahuloa homesteads to Honokaa on the windward coast, where the rainy season is said to be from January 1 to December 31. From here the road extends southeasterly to Hilo. This latter portion of the road is subject to excessive rainfall, averaging from 150 to 300 ins. per year, and the soil is similar in character to the clay of the Eastern States. Very deep and narrow gulches are frequent, and in order to connect the various settlements along the coast the road often traverses many additional miles. One of the most noted, and perhaps worst sections of the entire belt road is the portion known as the Bolabola, which in long continued wet weather is almost impassable.

Illustration No. 7 shows a section of completed highway north of the city of Hilo.

ILLUSTRATION NO. 7—VIEW SHOWING A COMPLETED SECTION OF THE BELT ROAD NORTH OF THE CITY OF HILO, HAWAII.

The Eau Claire, Wis., City Council has awarded the contracts for 10,182 sq. yds. of concrete paving to the Cast Stone Construction Co., of Eau Claire, at $1.16 per sq. yd.

The Voters of Palm Beach County, Florida, will vote on a proposition to issue bonds to the amount of $800,000 for roads and bridges. The election will be held on May 23.

The Annual Report of the Street Department of Salt Lake City, Utah, contains the following recommendations: Construction of a steel bridge over the Jordan River at 12th South St., to replace the wooden structure now in use, and building a concrete conduit at Emigration Canyon and removing the old bridge at 21st East St. The department was operated during 1914 at a cost of $204,167.64, over 11 miles being added to the paved district during the year.

The Evolution of the Asphalt Pavement in Toronto.*

In the year 1888 the first asphalt pavement was laid in Toronto, on Bay Street, between King and Front Streets. The construction of this pavement created a great deal of interest, as it marked the inception of an entirely new class of pavement in Toronto. Almost any time during the day crowds could be seen on the sidewalks, showing a very deep interest in what was going on, especially when the surface gang, composed mostly of negroes, started to work.

The men employed on the surface work were practically all imported from the States, and it was quite a long time before there were enough local men sufficiently well broken in on the work to make it unnecessary to retain the negro experts longer. Today there are perhaps two or three colored men still engaged in the work of laying asphalt pavements.

At the present time the construction of any pavement, be it asphalt or something else, creates only a passing interest, to such an extent have the people become accustomed to modern methods of building good roads.

The specifications governing the construction of this first pavement were somewhat meager and apparently the five-year guarantee demanded was thought to be sufficient protection. The foundation was composed of 6 ins. of hydraulic cement concrete of the following proportions: 1 part hydraulic cement, 2 parts sand, and sufficient crushed stone or brick to give a surplus of mortar when rammed. A rather indefinite specification, you will admit. However, the work must have been good, for a large portion of the original concrete is still on the street and does not show any signs of failure.

The surface consisted of a cushion coat, ½ in. in thickness, and a surface of 2 ins., or a total depth of wearing surface of 2½ ins. The usual methods of rolling and finishing were used. The cushion coat was of poorer mixture than the surface and served no useful purpose except that it would have probably proved difficult to rake to an even surface a mixture having so great a thickness as 2½ ins.

This type of pavement was used on all streets, whether of light or heavy traffic, until 1892, except that in 1889 the proportions for the concrete were changed and Portland cement was specified. The proportions were as follows: 1 part Portland cement, 5 parts sand, and enough broken stone (no bricks this time) to give a surplus of mortar when rammed. In 1892 the popularity of the asphalt pavement became very apparent, but the cost, which was upwards of $4.00 per sq. yd., was prohibitive; so a new pavement for light traffic streets was designed, which reduced the cost to about $2.50 per sq. yd.

This light asphalt pavement consisted of a 4-in. concrete base, with a 2-in. asphalt surface. No cushion was used in the construction of this pavement. In 1895 the possibilities of the light asphalt pavement became very apparent, for in that year the light pavement was used on all residential streets. The specification became standardized, and the price had been reduced to about $2.00 per sq. yd. The concrete was composed of 1 part cement, 3 parts sand and 6 parts stone. The surface was 2 ins. in thickness, with no cushion or binder. From 1895 to 1910 the light asphalt pavement was the standard for residential or light traffic streets, the only change occurring in 1901, when the proportions of stone, sand and cement in the concrete were changed to 1:3:7.

During this interval by far the greater part of the yardage of asphalt pavements laid in the city was of the light type; and, generally speaking, it has given the greatest satisfaction. The price of this pavement was at one time as low as $1.30 per sq. yd., caused by an epidemic of price cutting, but a fair average during this time would probably be $1.75 per sq. yd. The guarantee varied from 5 to 10 years. Today there are many of these pavements that are out of guarantee and that are giving good service; and the repairs required annually are not so serious as to render it necessary to resurface the streets.

The popularity of this type of pavement, however, led to difficulties and, in several instances, this type of construction was used on streets that were of residential character at the time the pavement was laid but, due to the good pavement and the changed character of the district, a much heavier traffic reached the street than was anticipated, with the result that the pavements failed either on the surface or in the foundation a few years after they were constructed. These mistakes in judgment, together with the advent of the high speed motor truck, led us in 1910 to discontinue the construction of the light pavement altogether.

In 1908 a medium type of pavement was introduced to provide for those streets that were not entirely residential and on which it was considered that heavy traffic might occur in the future. This was an effort to provide a cheap pavement for all classes of traffic and at the same time to prevent a recurrence of the trouble referred to above in connection with the light pavement.

This pavement consisted of a 5-in. concrete foundation of 1:3:7 mix, 1 in. of binder and 2 ins. of surface. In 1910 this type was substituted for the light pavement and became the standard for all streets except those in the downtown district or those upon which there were street car lines.

Turning now to the heavy pavements, we find there was little or no change from 1888 to 1900 with the exceptions noted above in regard to changes in the proportions for concrete. In 1900 the cushion coat was abandoned and a binder coat ¾ in. in thickness was substituted, with a surface of 1¾ ins. The binder provided a better mechanical bond between the asphalt surface and the concrete foundation, and it was also supposed to prevent the absorption of moisture from the concrete, causing the pavement to deteriorate from below. In 1903 another change was made in the surface. The total depth of surface was increased to 3 ins., made up of 1 in. of base and 2 ins. of top. From 1903 to 1913 the heavy pavement consisted of 6 ins. of 1:3:7 concrete, 1 in. of binder and 2 ins. of surface. In 1914 the binder course was increased to 1½ ins., the surface remaining at 2 ins., and what is termed a "close" binder was specified instead of the open binder formerly used.

The open binder was composed of ¾-in. stone coated with asphalt, with little or no fines, while the close binder is made of graded stone with sufficient fines added to at least partially fill the voids.

The close binder was adopted for two reasons: first, on account of the difficulty in getting the open binder to stay in place during the process of laying the surface, and, second, it was considered that a better surface could be produced by using a binder that was at least partially filled to start with.

Towards the close of 1914 the depth of concrete used on streets with track allowances was increased from 6 ins. to 8 ins., as it was thought that the heavy impact stresses caused by large motor trucks with steel tires were likely to cause failure of the narrow strips of pavement alongside the rails, as it is quite impossible, under present conditions in Toronto, to get any reasonable distribution of traffic on the streets where car tracks are constructed

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The State Association of Road Supervisors of Pennsylvania, consisting of the presidents of county road associations, organized recently at Harrisburg. The officers are: President, Thomas R. McConnell, Chester; Vice Presidents, Dr. A. E. Leaman, Lancaster, and J. A. L. Lohr, Union; Secretary, J. F. Evans, York; Treasurer, Elias D. Messner, Dauphin.

The Total Expenditure of the 15 Districts of Baltimore County, Maryland, for roads during 1914 was $477,333.61, according to the annual report of William G. Sucro, County Roads Engineer. Of this total, $391,460.08 was expended for materials and $61,883.78 for labor. The remainder was used for miscellaneous expenditures. The total expenditure for new bridges and culverts was $19,878.68, while the expenditure for painting bridges amounted to $1,031.61. During the year, 422,835.5 gals. of bituminous material were used for surface treatment, the cost of the material being $23,342.44.

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*From a paper of the same title presented by George Powell, Deputy City Engineer of Toronto, Ont., at the second Canadian and International Good Roads Convention at Toronto, Ont., March 22-26.

Wearing Tests for Sand and Gravel

By **F. L. ROMAN**[*]

The construction of concrete roads requires the use of materials which will insure a pavement of good strength and with good wearing qualities. The cement, as a rule, has been carefully tested according to standard methods, but the quality of the aggregates has not always been determined with the care that it should receive.

It is true that specifications for concrete roads generally require that the aggregate be fairly well graded and composed of clean, hard and durable materials. They require also that the sand shall not contain an excess of organic matter, clay, loam or very fine material, and that the sand shall give a mortar of a certain strength when compared with the mortar obtained from standard Ottawa sand. No methods, however, are given to determine the hardness of the aggregates, and the acceptance or rejection of the materials is generally based upon their appearance. It is very difficult to judge of the wearing qualities of many gravels, and with fine aggregates it is often practically impossible for the most expert builder to determine its hardness by its appearance.

The purpose of this article is to describe two tests of the wearing qualities of aggregates which have been used in the laboratory of the Illinois State Highway Department, and which have given much valuable information. Both tests require very little equipment in addition to that possessed by the ordinary road materials laboratory, and can be easily performed.

Wearing Test for Sand

The test consists essentially of submitting a given weight of sand to the wearing effect of an ordinary Deval abrasion machine, the cast iron cylinders of which contain a certain weight of small steel shots. The test is performed as follows:

The sample of sand is quartered down to a weight of about 2 lbs. It is then washed free of all organic matter and clay, and kept at a temperature of about 110° C., until well dried. All coarse pebbles above ¼ in. are screened out, and the sand is screened carefully on a 50-mesh sieve to remove all the very fine material. Five hundred grams of the sand are then weighed to within 0.1 gram, and placed in the cast iron cylinders of the abrasion machine with 250 grams of ½-in. spherical steel shots. One thousand revolutions, at the rate of between 30 and 33 per minute, constitute a test. Only the percentage of material worn off which passes through a 100-mesh sieve is considered in determining the wear. The sand in the cylinders is taken out and all material passing a 100-mesh sieve is discarded. The sand is weighed again to within 0.1 gram, and its loss in weight is considered as the wear and calculated in per cent. of the original weight of sand.

The amount of the sand which is either retained on the ¼-in. sieve, or which passes the 50-mesh sieve is usually limited by specifications, and will seldom exceed 10 per cent. It may be assumed that the small percentage of sand which has been discarded has, in general, the same wearing qualities as the main portion of the sand, and that the relative percentages of wear found in this test represent also the relative wearing qualities of the sands.

Various quantities of sand have been tried in this test, and the 500-gram sample was found to be the most satisfactory when accuracy, ease of handling and speed in testing are considered Representative samples of this size are obtained by quartering larger samples, and it has been found easier to secure a fair representative sample of sand of 500 grams than to obtain a fair representative 5 kilogram sample of 1½-in. gravel.

The ½-in. spherical steel balls used in this test may be readily obtained from any automobile repair shop. They weigh slightly less than 12 grams each, and 21 balls weigh within ½ gram of 250 grams. Their wear in the abrasion cylinder is very small. After 25 tests, a charge of 250 grams of these balls has shown a loss of only one gram. It is recommended, however, that a charge should be discarded when its variation in weight from 250 grams is greater than 1 per cent., or 2.5 grams.

These small steel balls seem to have very little effect on the cast iron cylinders except to keep them free of dust. When the sand has been properly dried, practically no dust remains attached to the sides of the cylinders and the sand can be removed readily without loss.

When the sand has been removed from the cylinders, it has been found most satisfactory to sift portions of about 100 grams at one time. The dust can be readily removed in this manner, but it is advisable to complete the sifting above a piece of white glazed paper to ascertain that no material is passing through the sieve. Repeated wearing tests on a sand should check within 0.1 to 0.2 per cent.

A number of sands which have been submitted to the wearing test described above are given in Table 1. The sands are tabulated according to their per cent. of wear. It will be noted that standard Ottawa sand shows practically no wear in this test, and that the sands composed mainly of quartz show very little wear. The mixed sands show average wearing qualities, while the limestone sands give the poorest wear.

It will be noted also, that six samples (Nos. 1015, 1016, 941, 958, 854 and 942) have been obtained from the same pit, and that their per cent. of wear varies from 3.2 to 6.0. The material obtained from this pit consists of a large per cent. of fine quartz mixed with varying small quantities of slate, ochre, limestone, etc. Although the variations in the amount of soft material in this sand are indicated to some extent by its appearance, they are made much more apparent by the wearing test.

While none of the sands given in Table 1 are of very poor quality, yet the per cent. of wear obtained, varies from 0.2 to 7.6, and the test appears to bring out readily the poor wearing qualities of the material. If it is realized that the sand used in concrete roads will represent, as a rule, at least 30 per cent. of the surface of the pavement, the value of the wearing test described will be readily appreciated.

Wearing Test for Gravel

This test is performed also in the Deval abrasion machine, and in a manner similar to the abrasion test for rocks. No shots are used, and the wear is due to the grinding of the stones against each other and against the sides of the cast iron cylinders. The amount of wear will depend to some extent on the size of the pebbles used. In general, specifications for the coarse aggregates used in concrete roads require, however, that the gravel shall be well graded between certain sizes; that it shall, for example, all pass a 1½-in. screen and be all retained on a ¼-in. screen, and that between 40 and 70 per cent. of the gravel shall pass a ¾-in. screen. Wearing tests on gravels meeting the requirements of these specifications, will, therefore, be made on materials containing approximately similar amounts of coarse and fine pebbles, and the relative losses shown in the tests should represent fairly closely the relative wearing values of the gravels. The test is performed as follows:

The gravel is quartered down to about 15 lbs. and washed free of dust, clay and foreign matter. It is thoroughly dried at 110° C., and all material either retained on a 1½-in. screen or passing a ¼-in. screen is rejected. A test sample of 5 kilograms is selected and weighed to within 1 gram. It is then placed in the cast iron cylinders without the further addition of any shots. Ten thousand revolutions in the Deval machine, at the rate of between 30 and 33 revolutions per minute, constitute a test. Only the percentage of material worn off which will pass through a 16-mesh sieve is considered in determining the amount of wear. The gravel is sifted, washed, dried and weighed to within 1 gram.

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[*] Testing Engineer, Illinois State Highway Department.

The loss in weight is considered as the wear, and calculated in per cent. of the 5 kilograms used.

The wearing qualities of a few gravels submitted to the test described above are given in Table II. The per cent. of wear is given in the last column, and the gravels are tabulated according to their wearing qualities. The values given vary from 0.84 to 3.30 per cent. and the variation may be emphasized by using a coefficient such as the French coefficient of wear. The amount of wear of the gravels tabulated above, when expressed by the French coefficient, will vary between 47.6 and 12.1. While this test has not been found to be always as satisfactory as the test described for sands, yet it gives much valuable information.

TABLE I.—TESTS OF SANDS

(The sands are tabulated according to their loss by the wearing test)

Laboratory Number	Pit	Furnished by	Nature of Material	Sieve Analysis									Tensile strength of mortar of 1 part cement and 3 parts sand in per cent. of the tensile strength of mortar obtained with 1 part of the same cement and 3 parts of standard Ottawa sand.			
				Per cent. passing ¼ inch sieve	Per cent. passing ⅛ inch sieve	Per cent. passing 1-10 inch sieve	Per cent. passing 1-16 inch sieve	Per cent. passing 1-20 inch sieve	Per cent. passing 1-30 inch sieve	Per cent. passing 1-50 inch sieve	Per cent. passing 1-100 inch sieve	Per cent. clay or loam in sand	Age 7 days	Age 28 days	Age 90 days	Per cent. of wear of sand
....	Ottawa, Ill.	Ottawa Silica Co.	All quartz (Stan. Ottawa S.)	..	..	..	..	100	0	..	..	0	100	100	100	0.2
1121	Ohio River, Cairo, Ill.	Yourtee-Roberts Sand Co.	Silicious mat., mainly quartz	95	84	81	77	76	66	11	1	0.2	101	..	..	1.0
635	Mississippi River, Alton, Ill.	Mississippi Sand Co.	Silicious mat., mainy quartz	91	85	81	71	60	35	3	0	0.15	98	89	81	1.3
801	Mt. Carmel, Ill. (River gravel).	Mt. Carmel S. & G. Co.	Mixed materials, some shells	61	38	30	18	14	6	2	0.5	0.3	138	119	122	2.5
778	Petersburg, Ill.	Virginia Canning Co.	Mixed mat., 1% organic loam	97	91	86	75	68	45	6	1	2.2	101	86	91	3.0
862	Attica, Ind.	Indiana S. & G. Co.	Mixed materials	92	73	62	45	39	25	6	1	2.0	136	133	138	3.2
1015	Lincoln, Ill.	Lincoln S. & G. Co.	Mixed materials	97	90	85	79	64	42	6	1	0.2	113	121	...	3.2
1016	Lincoln, Ill.	Lincoln S. & G. Co.	Mixed materials	98	93	88	80	73	49	8	1	0.2	112	113	...	3.4
731	Rockford, Ill.	Rockford S. & G. Co.	Mix. mat., a large % quartz	95	80	73	68	57	40	6	1	0.6	108	103	106	3.4
888	....	E. J. Mahoney & Co.	Mixed materials	95	76	69	57	47	32	5	3	1.3	110	123	141	3.5
941	Lincoln, Ill.	Lincoln S. & G. Co.	Mixed materials	99	95	88	82	70	48	11	1	0.3	112	105	118	3.6
990	....	P. Flannery & Son, E. St. Louis, Ill.	Mine chats, large % limestn.	88	49	39	17	13	6	3	1	0.7	148	149	155	3.8
958	Lincoln, Ill.	Lincoln S. & G. Co.	Mixed materials	96	93	83	75	59	37	9	1	1.0	113	114	127	4.3
880	....	M. C. Hall, Eureka, Ill.	Mixed materials	96	67	47	42	23	11	5	1	0.6	154	148	150	4.3
1036	Spring Valley, Ill.	Western S. & G. Co.	Mixed materials	60	41	39	20	17	12	2	1	5.0	155	152	...	4.4
783	....	Beardstown Concrete Const. Co.	Mixed materials	73	43	37	22	19	16	3	1	2.0	140	112	118	4.6
854	Lincoln, Ill.	Lincoln S. & G. Co.	Mixed materials	100	95	87	75	62	41	11	1	0.6	116	111	119	4.6
857	....	Illinois S. & G. Co.	Mixed materials	77	50	46	40	37	28	3	1	0.5	120	121	125	4.6
842	Waukesha, Wis.	Waukesha Lime & Stone Co.	Mix. mat., large % limestone	97	69	46	36	19	8	2	1	0.3	144	146	158	4.8
872	Peoria, Ill.	Mackinaw S. & G. Co.	Mixed materials	96	72	58	40	33	21	8	3	1.0	131	141	150	5.4
942	Lincoln, Ill.	Lincoln S. & G. Co.	Mixed materials	99	92	88	80	71	51	10	1	0.5	113	109	117	6.0
980	Vandalia, Ill.	P. M. Johnston, St. Elmo, Ill.	Mixed materials	90	81	65	61	46	34	8	2	1.3	148	148	144	6.2
1123	Aurora, Ill.	....	Mainly limestone	67	43	36	24	20	11	3	1	1.5	...	...	...	7.3
884	....	American S. & G. Co., Chicago, Ill.	Mainly limestone	97	87	76	67	52	31	10	2	1.7	120	125	140	7.6

TABLE II—TESTS OF GRAVELS

(The gravels are tabulated according to their loss by the wearing test)

Laboratory No.	Pit.	Furnished by.	Nature of material.	Sieve Analysis						Per cent. of wear of gravel
				Per ct. passing 1½-inch sieve.	Per ct. passing 1¼-inch sieve.	Per ct. passing 1-inch sieve.	Per ct. passing ¾-inch sieve.	Per ct. passing ½-inch sieve.	Per ct. passing ¼-inch sieve.	
....	Meramec River	Union Sand & Material Co., St. Louis, Mo.	Chert	100	..	..	..	..	0	0.84
615	Wabash River	Mt. Carmel Elevator Co.	Mixed silicious materials.	..	100	99	95	84	54	0.92
1120	Ohio River, Cairo, Ill.	Yourtee-Roberts Sd. Co.	Mixed silicious materials.	98	89	75	53	38	12	0.94
1025	Wabash R., Attica, Ind.	Attica Gravel Co.	Mixed silicious materials.	99	..	88	80	57	2	1.00
949	Beloit, Wis.	Logan & Giertz Con. Co.	Mixed materials	100	..	85	56	4	0	1.08
887	....	E. J. Mahoney & Co.	Mainly limestone	100	..	95	83	58	10	2.08
858	....	Chicago Gravel Co.	Mainly limestone	100	..	83	45	9	1	2.12
802	Wabash River, Mt. Carmel, Ill.	Mt. Carmel S. & G. Co.	Mainly silicious materials, 5% shells	100	..	90	82	65	23	[illegible]
1103	Mississippi River, La Grange, Mo.	Cameron, Joyce & Co., Quincy, Ill.	Mainly silicious materials	100	98	93	76	37	3	2.22
784	....	F. C. Feutz, Watseka, Ill.	Mixed materials	100	..	90	58	8	1	2.30
719	Joliet, Ill.	Joliet S. & G. Co.	Mainly limestone	100	..	93	75	38	6	2.30
853	Rockdale, Ill.	Chicago Gravel Co.	Mixed materials, a large per cent. of limestone.	100	..	95	78	33	3	2.34
843	Waukesha, Wis.	Waukesha L. & Stone Co.	Mixed materials	100	..	60	31	8	0	3.02
647	....	Mackinaw S. & G. Co., Peoria, Ill.	Mixed materials	100	..	83	66	37	2	3.30

Maintenance[*]

Why should so many people expect a roadway or pavement, no matter of what type or of what first cost, to take care of itself under traffic? And yet is this not too often the situation?

A road is built by funds obtained from direct taxation or bond issues, and being, in most cases, better when new than the older highways near it, draws travel from them, thus carrying a traffic greater than ever before. Then, usually, this new roadway is left absolutely without care while the attention of the authorities is concentrated on some piece of new construction. The result is what might be expected. In a short time small defects appear, which rapidly grow serious, and if the neglect continues it may be but a short time before the road surface goes entirely to pieces and the road begins to be a source of complaint. If the neglect still continues, the reconstruction of the road is demanded; and if then some—but still insufficient—attention is paid to the complaints, and repairs, however inadequate, made, the size of the repair bill soon becomes an object of criticism. At about this time, criticisms of the original construction begin to be heard, and the majority of those interested perhaps come to believe that the fault was with the original method of construction rather than with anything else. As a matter of fact, it is probable that the construction was too good rather than too poor. This is the history of most of the road construction in this country, the cause of the deterioration, in ninety-nine cases out of one hundred, being the failure to properly maintain the newly completed work.

The importance of proper maintenance cannot be overestimated, and it is beginning to be appreciated in this country. In the older European countries its importance is fully appreciated, and the reputation for good roads that some of these countries enjoy rests upon their careful and efficient maintenance work. American investigators are agreed upon this point. There is no question but that American construction when new is in every way equal to, or better than, foreign construction, nor is there any question but that for the first few months our new highways are equally as good, or better than, foreign roads. Soon, however, American roads begin to drop behind and at the end of a relatively short period are, as a rule, far inferior to foreign roads. This is simply because foreign road authorities keep their roads continuously as good as when first completed, while ours are allowed to wear out and are only intermittently—if at all—repaired and restored.

It seems strange that in this country the extravagance of the neglect of proper maintenance has not attracted more attention. It is a well-known fact, or it should be, that the neglect of maintenance increases the amount of deterioration out of all proportion to the time involved, and, therefore, correspondingly increases the cost of repair. In other words, if a newly built road without maintenance will require $100 for repairs at the end of the first year, at the end of the second year it will require not twice that amount but more than twice that amount; at the end of the third year, not three times $100, but more likely $1,000, or even more. At the end of five years the bill for putting the road back in good condition would not be $500 but more likely $2,500. If, on the other hand, $100 would have put it in good condition at the end of the first year and this $100 had been properly expended, then only another $100 would have been required at the end of the second year, and at the end of five years $500, not $2,500, would have to be expended.

There is no question but that the same system of constant care over the roadbed as is adopted by the railroads is the most economical for adoption in highway work. As a general thing, the construction and maintenance work of the railroads of this country has been performed efficiently and economically, and it is, therefore, reasonable to assume that the constant, careful maintenance of railroad tracks and other properties is considered by the railroads as simply good business and that their judgment in the matter is worth respecting. Why then should exactly the opposite view apparently be taken by highway authorities?

Where highway maintenance has been attempted to some extent, two schemes have been quite generally adopted, and probably the bulk of the maintenance in this country has been carried out under one or the other of these. One is the assignment of a more or less definite section of a public road to some individual for maintenance. This indvidual is credited with a limited fund and, in general, is left to his own devices for performing the work, for selecting the time of its performance and for its quality. In the majority of cases, the result has been a failure, and the reasons for such a result are the natural ones. In the first place, the individual is usually selected on political grounds and not on the ground of economy and efficiency. In the second place, when a selection is made with the intention of picking the best possible man for the place, the lack of definite agreement as to what work shall be done and how and where it shall be done results in the performance of the work when it best suits the individual having it in charge.

According to the other scheme of so-called maintenance, an indivdual is selected to have charge of the work in a considerable portion of the area covered by the central authority, and there is placed to his credit a limited but often fairly large sum for carrying on the work. In some cases this individual receives no salary, or at least only a nominal one. The statements made concerning the selection of the individual under the other scheme apply equally well under this. Even in the event of the selection of the proper man for the work and the payment to him of a proper salary, the conduct of the work in most cases is uneconomical, inefficient and unsatisfactory because the usual way of performing it is to get together a gang of men and teams and start out, either before the time for farm work begins in the spring or after the harvest in the fall, and, taking the roads consecutively, to attempt to do all of the work for the year at one time and that time a short time. For the balance of the year, the roads get no attention at all; the repairs are intermittent and irregular instead of constant, regular and careful.

A man cannot run his farm and at the same time give proper attention to the maintenance of several miles of highway, because the demands of the two kinds of business are bound to conflict. The one exception to this is in the matter of the log drag. The farmer can do valuable work on the road with this implement, and he can use it to the best advantage when weather conditions are such that a team can well be spared from the farm work.

The reason for the neglect of American roads is that construction has been allowed or encouraged to interfere with, and prevent, proper maintenance. In any new country the construction of roads of some kind or another is one of the first necessities, and in a country as large as this, it has, of course, been impossible to build all the roads demanded as fast as they were needed; and it has also been impossible to replace one form of construction with another more suitable to the rapidly increasing traffic when the need for such reconstruction became evident. As a consequence, road authorities, with the limited funds at their disposal, have been obliged to devote their energies largely to new construction, and to neglect, to some extent at least, the maintenance of the roads completed earlier. In addition, the difference between unimproved paths which had developed into roads through the amount of traffic over old trails, and the improved roads—even though the latter had fallen into a deplorable condition through neglect—was so great that the public demand was for further construction rather than for restoration of the deteriorated earlier construction. Well stoned roads, even though worn into holes and most unsatisfactory at certain seasons, were so much better, in the opinion of the public, than the unstoned roads that there was a demand for further stoning rather than for the repair of those already stoned—at least until the latter got to be nearly impassable.

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[*] Abstract of a paper presented by Major W. W. Crosby, Consulting Engineer, Baltimore, Md., before a convention of the Southern Appalachian Good Roads Association at Bristol, Tenn.

Again, the organization of a locality's forces has usually been at fault in the neglect of maintenance. Those in charge of road work have generally had under their jurisdiction both construction and repair. The requirements of maintenance work demand the prompt and careful performance of little things; persistence and continuity of action; good judgment and craftsmanship in actual work, and a high regard for economy. Maintenance work includes far less of the spectacular than does construction. On the other hand, the problems of construction are interesting and relatively short-lived, demanding spurts rather than long-winded action. Among human beings in this country, the men of the bulldog, tenacious type in effort are less available than those keenly interested for the time being and capable of short spectacular dashes at high speed. For this reason, there has been in the road departments a lack of interest in maintenance work and a tendency to neglect it for the more interesting work of construction.

With the advent of the modern road and the realization of its high first cost, there has been an awakening to the desirability of securing as much good as possible from the initial outlay and to the only opportunity for securing the most good, i. e., through the proper maintenance of new construction. The subject of maintenance is, therefore, beginning to be discussed on a par with the subject of construction. As a matter of fact, construction itself is generally subordinate to maintenance. Maintenance needs construction for its being; in other words, a thing cannot be maintained until it has been constructed. What determines the character of the road surface to be constructed? Is it not consideration of the cost of maintaining the best surface possible under traffic, and is not the selection made because one surface will be more easily and cheaply maintained and more satisfactory in service?

The first necessity in the maintenance of any kind of road is to prevent damage by water. An earth road must be kept crowned so that water falling upon it will not remain on the carriageway but will be shed to the sides and then disposed of in such a way that it will not be absorbed by the roadway or its foundation. The best and cheapest means yet devised for crowning and keeping the roadway in condition is the continuous proper use of the log drag. This implement will be found useful and economical in the maintenance of any roadway with earthy or gravelly shoulders, even if the road has a center strip of as hard a material as concrete. The next thing of importance is to see that the water courses along the road and under it are kept open. Obstructions, such as earth, leaves, brush, etc., must be prevented or removed promptly if washouts and other results expensive to correct are to be avoided.

Having taken care of the water, the next thing is to repair and care for the road surface so that it will remain as impervious as possible to water and as even and homogeneous as practicable under the wear it has to sustain. The log drag is the best means for obtaining these results on an earth or soil road, and it will also be a great help on a sand-clay road. As the road crust grows harder, the use of the drag must give way to hand labor with a pick, rake, shovel and perhaps a tamper. If, for instance, a small depression that holds water appears on a gravel road, it must be repaired promptly if a serious hole is to be avoided. If the bottom of the depression is tight and firm, the material should be picked loose for an inch or so in depth. If, on the contrary, it is loose, clean out the loose material until the edges of the hole are nearly vertical and then put in fresh material, tamping it well and covering it with finer sizes so as to aid in compaction. For repairs, always use, as nearly as possible, the same material as exists in the adjacent roadway.

Broken stone roads, in the main, should be treated in the same way. Sometimes both gravel and broken stone roads show a tendency to ravel in dry periods. If the effect is due merely to dryness, one of the best remedies is to apply a thin layer of sand (not over ¼ in. thick) before the raveling has gone too far. The surface will then quickly tighten up under traffic. Do not use clay. If this application of sand is delayed until the raveling extends an inch or more below the surface and generally over the whole road, it will be necessary to use a roller and water to restore the surface to the proper condition.

All of these things are little things, but in order to prevent large expenditures for repairs the little matters of maintenance must be promptly and efficiently attended to.

Construction problems will undoubtedly be presented for solution and discussion, more or less intermittently, for years to come, as changes in traffic occur and as the knowledge of the science of road building develops. Maintenance problems should and will be continuously discussed for an indefinite future. They are affected by traffic conditions, by new solutions of construction problems and by changes in social conditions. Their importance is increasing, and the general appreciation of their importance is also increasing. For the next few years, at least, this appreciation cannot increase and extend too widely for we are starting behind where we should be in the matter.

The County Commissioners of Madison County, Ind., have granted a petition for the construction of 3 miles of concrete pavement to connect Chesterfield and Anderson with 2 miles of paved highway. This will make the longest paved road in the county.

The Supreme Court of North Carolina has decided that the Davidson County road bonds, amounting to $300,000, are legal, and the County Road Commission will at once proceed with road building. The bonds were sold dependent upon the decision of the court.

A Lecture Course in Road Building and Maintenance was given at the Maryland Agricultural College, College Park, Md., in March. The course occupied an entire week and comprised lectures by members of the staff of the Maryland State Roads Commission, members of the faculty of the Maryland Agricultural College, engineers from the U. S. Office of Public Roads and others. The course was given for the first time this year and it is planned to make it an annual affair.

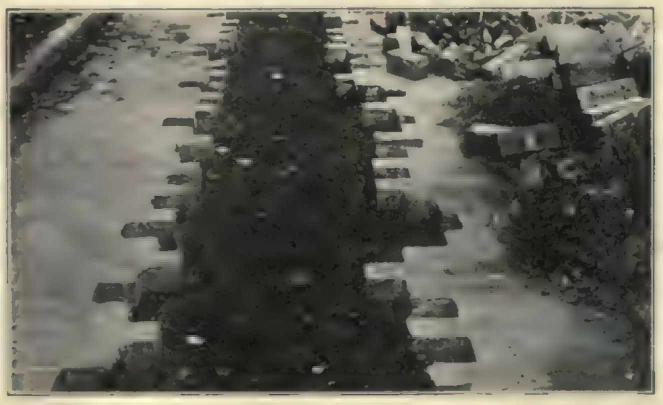
May 26 is to be Observed as "Good Roads Day" in Erie County, Pennsylvania, according to a decision arrived at at a recent meeting of the Township Supervisors, County Commissioners and officers of the Erie Board of Commerce, the Erie Commercial Club and the Erie Motor Club, held at the Court House in Erie. It was also decided that if May 26 should be unpleasant the following day would be observed. The Agriculture Committee of the Board of Commerce was authorized to act as a central committee to plan the details of the work and distribute literature. According to present plans, especial attention will be paid to earth roads, and it is also proposed to operate 40 road drags belonging to the Erie Motor Club.

Methods of Repairing Brick Pavements After Street Openings

By P. J. MASTERSON*

So much of the mechanism of a modern city lies under the surface of its streets that the question of street repair is scarcely less vital than that of good original paving construction, if streets are to be constantly serviceable. The excavator is the worst foe of any pavement and the efficient repair man is its best friend, and will be, so long as sewer, water, gas, telephone, power and steam lines are laid in conduits or trenches.

Foresight will cut down the number of openings that it is necessary to make in a completed pavement, but no pavement is ever laid in a growing town without the certainty of being disturbed from time to time. In Cleveland, where we have a preponderating mileage of brick streets, it has been necessary to work out careful methods for the replacement of brick paving that has been disturbed. While the process calls for workmanlike exactness, we pride ourselves on patching brick streets so that their strength is unimpaired and, in many instances, so that the patch cannot be noticed at casual observation. This is more than can be said for some other forms of pavement.



BRICK PAVEMENT TOOTHED OUT PREPARATORY TO LAYING CONDUIT—E. 90TH ST., CLEVELAND, O.

Our first precaution is to have the city relay all the disturbed pavement. Service corporations and other private concerns are permitted to make openings in streets upon filing proper application. With this application must come a deposit sufficient to cover the cost of replacing the pavement. The city inspects the methods of excavation and particularly dictates the methods of backfilling. But when it comes to the actual repaving no one but the employes of my department are entrusted to do the work. The cost is deducted from the deposit and the balance, if any, returned to the party making the excavation.

I am a firm believer in the policy of compelling the return of all excavated earth to the trench. Only in case of rock excavation would I make any exception. It may be argued that the pipe or conduit takes up a certain amount of space and therefore a corresponding volume of earth may be left out of the trench. But experience shows that by tamping, more earth can always be returned to a trench than was removed from it, and the practice of requiring it all to be returned leaves no pretext for spongy backfills, which are a dangerous menace to the security of any pavement.

In replacing a brick pavement over a trench, we adhere closely to the original specifications used in constructing the pavement, leveling the subgrade and laying, successively, the concrete base, the sand cushion and the brick.

The joint of the completed patch with the original pavement must, of course, be in the original serrated pattern. In making the cut through the pavement alternate brick will sometimes be broken in the middle, leaving a series of broken bricks along the edge of the cut. These half bricks must be "toothed" out with a chisel. We use one about 18 ins. long, so that none but whole bricks remain. It is then possible to break joints in patching. A patch which does not dovetail into the original pavement, but leaves a long straight longitudinal joint between patch and pavement, cannot be too strongly condemned.

I may remark that a long handled chisel is the best instrument to use in making the original cut in a pavement. After an opening has been broken with a maul the chisel can be used to cut and pry out each brick separately, making a cleaner opening and facilitating the patcher's job.

Matching brick for the patch is an important matter. If the color and size coincide with the original pavement, the patch will be scarcely noticeable. The brick should be carefully measured in matching for size. Where the new brick are a hair's breadth thicker than the old ones, the courses are thrown out of series and good joints are impossible.

The proper compacting of the sand cushion presents a difficulty that is not found in new jobs of paving. Sand has probably been lost from the original cushion during excavation and it is necessary not only to compress the sand cushion downward in making the repair, but to force it laterally under the edges of the old pavement. For this purpose we use a form of sand rammer, consisting of an iron handle 6 ft. in length, with a rectangular head turned at an angle of 45 degrees from the line of the handle. This compacts the sand at the edge of the cut and an ordinary wooden rammer or a narrow hand roller does the same service for the width of the patch.

BRICK PAVEMENT REPLACED IN OPENING SHOWN IN THE ILLUSTRATION OPPOSITE.

Grouting must be done with care and exactness, two to four applications being swept into the joints and the brick swept clean at the last application. The remaining part of the task is simple precaution against disturbances while the grout is setting. The patch should be covered with three inches of moist sand and barricaded for a period of ten days or two weeks. It is a good extra precaution to barricade the entire street, where conditions permit, and thus avoid the jar of passing vehicles. But this is rarely possible on the ordinary busy street, so the best that we can do is to keep traffic off from the patch during the period of setting.

These were the methods used in replacing over 42,000 ft. of pavement last year. Our department deals with many kinds of pavements and while there are others upon which superficial repairs can be made more easily and promptly, there is none in which the original strength of the pavement is more fully restored than in a brick pavement where there is due care in the workmanship and a careful selection of materials.

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*Superintendent of Street Repairs, Cleveland, Ohio.

The Value of the Absorption Test for Wood Blocks*

By GEORGE W. TILLSON†

When municipal engineers were considering the advisability of laying treated wood block pavements, some twelve or fourteen years ago, it was uncertain as to just what should be the requirements of the specifications. It was well known, from previous experience, that the blocks should be treated, but just what the nature of the preservative should be and how much should be used were not well known. At that time it was proposed to treat the blocks with what was known as the creo-resinate process; that is, the preservative should be composed of one part of creosote oil and one part of resin. That being the adopted plan, it was necessary to determine how much of the preservative should be applied to the wood.

It was felt that it was necessary to preserve the blocks from decay and also to treat them so that they would be stable under all climatic conditions; that is, they should not absorb so much water as to swell and cause the pavement to bulge during a wet spell, nor should they shrink too much in dry, hot weather, so that they would become loose.

The theory of the resin in the preservative was that the creosote oil, being a volatile substance, would naturally lose its value under climatic conditions, but that the resin would keep it in the blocks so that its preservative properties would be more enduring.

Just how to be sure that the blocks were treated with 20 lbs. of the preservative was a question, it not being deemed practicable to have inspection at the plant. It was finally decided that, knowing the weight of long leaf yellow pine (the wood that was to be used) to be about 42 lbs. per cu. ft., if the blocks would sink in water they had been sufficiently treated; and that requirement was made.

The test for expansion was not so easy. After careful consideration, however, it was decided to require an absorption test of the blocks. This test provided that after being dried in a kiln at a temperature of 100° F. for 24 hours and then immersed in water for an additional 24 hours, the blocks should not gain in weight more than 3 per cent. during immersion. Pavements were laid under this specification in 1903 and 1904, and on one street, with a preservative that did not contain any resin but was a specially prepared oil. The blocks obtained did, however, conform to the requirements as to weight and absorption. These pavements have been in use 10 and 11 years, without any expansion joint, and have required almost no attention on account of the instability of the blocks.

In certain cases where pavements were laid not under the supervision of the city, so that the absorption test was not applied, the pavements did expand to a very considerable extent. In one instance, the writer knows where blocks that were supposed to conform to the absorption test, but did not and had been condemned, were laid. These blocks expanded materially and had to be taken up and replaced.

The City of New York is the only municipality of which the writer knows where the absorption test is required, and it is also the only city, in his knowledge, where an expansion joint is not used.

Some five or six years ago the specifications were changed so that an oil having a specific gravity of 1.10 to 1.12 was used, without any resin. The absorption test was retained, however, but the percentage increased to 3½ for long leaf yellow pine. No trouble has occurred on account of bulging, even where expansion joints were not used.

The writer firmly believes that, with a heavy oil treatment and a specification requiring an absorption test, as given above, satisfactory results can be obtained without an expansion joint.

Some people believe that if a less amount of oil is used there will be less bleeding of the pavement, although by the use of an expansion joint practically the same results can be obtained. Whether the reduction of 3 or 4 lbs. per cu. ft. in the timber will materially reduce the bleeding of the pavement, when first laid, is uncertain so far as present experience goes.

It is not desirable to use expansion joints crosswise of the street; and if too much reliance is placed upon the expansion joint along the curb to take up the total expansion of the pavement, if a lighter treatment is used and consequently a greater absorption allowed, it is possible that bulging will occur lengthwise of the street when it would not crosswise.

The Borough of Manhattan, New York City, in the 1914 specifications, has decreased the amount of treatment from 20 lbs. to 18 lbs. and has permitted an absorption of 5 per cent., with no expansion joint; a bituminous joint filler is used, however. Just how pavements laid under these specifications will work out in practice has, of course, not been determined at the present time. If an expansion joint along the curb will take care of all thrust in any direction on account of expansion, with a less treatment than 20 lbs. per cu. ft. and a 5 or 6 per cent. absorption—although this is not admitted by the writer—the engineering question would be whether it would be desirable to have the lesser treatment with the expansion joint rather than the greater treatment without it. As the great majority of the wood pavements of this country of long leaf yellow pine are more apt to fail through some other agency than that of traffic, the writer feels that a little extra expense for the treating of the blocks will be justified in the long run.

He feels, therefore, that, from the experience of Brooklyn particularly, a stringent absorption test is of great value and that the expense incurred to make the blocks meet it is justified. He appreciates fully the inconvenience of making the absorption test, also the expense the contractors are likely to be put to if the blocks, after being delivered on the street, do not meet this requirement. The test, however, may be made at the plant where the blocks are treated, and if so made by an authorized inspector of the municipality and the blocks used soon after, he believes that this trouble would to a great extent be obviated.

Taylor, Tex., has Voted a Bond Issue of $225,000 for paving.

Laurel County, Ky., has voted to issue $100,000 in bonds. The proceeds will be used for highway improvements.

May 26 Will be "Good Roads Day" in Mercer County, Pa. The arrangements are being made by the Sharon, Pa., Civic Association. W. W. Moore is chairman of the highways committee of the organiaztion.

The County Court of Anderson County, Tenn., has voted an issue of $157,000 bonds for improvements which will include three steel bridges over Clinch River, $57,000, and road construction and improvement, $50,000.

Work on a New Highway Bridge over the Quinnipiac River at New Haven, Conn., will be started in May, according to present plans. The bridge will be 650 ft. long, 66 ft. wide and will carry a 40-ft. roadway with two 10-ft. sidewalks. The Board of Aldermen has already authorized the issuance of bonds to pay for the structure, which will cost about $250,000.

Elections on Bond Issues for Road Construction will be held in Washington and Johnson Counties, Tennessee. Washington County will vote on $425,000 in May, and Johnson County on $150,000 in August. Sullivan County has recently added a new issue of $100,000 to a $500,000 issue, the proceeds of which have already been spent.

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*From a paper presented before Section D of the American Association for the Advancement of Science at the Philadelphia meeting in December, 1914.

†Consulting Engineer to the President of the Borough of Brooklyn, New York, N. Y.

The New State Highway Commissioners of New York and Ohio

On this page we present brief biographical sketches accompanied by portraits of two state highway officials whose appointments have been noted in recent issues.

Edwin Duffey, who has succeeded John N. Carlisle as State Commissioner of Highways of New York, was born March 14, 1868, and received his education in the Cortland Normal School, Cortland, N. Y., at Amherst College and Columbia Law School, graduating with the degree "A. B." from Amherst in 1890 and receiving the degree of "L. L. B." from Columbia in 1893. He was admitted to the bar in 1893 and practiced law in Cortland until elected District Attorney of Cortland County, in which capacity he served from 1898 to 1901. In 1901 he was appointed receiver of the Cortland County Traction Co. and reorganized that company, later becoming its manager. He was appointed Commissioner of Highways on Feb. 6 of this year.

Clinton Cowen, who succeeded James R. Marker as State Highway Commissioner of Ohio, was born in 1862. A year or two after graduating from Denison University, at Granville, Ohio, he engaged in private engineering practice in Cincinnati. In 1901 he was elected County Surveyor of Hamilton County, Ohio, and was reelected six times. He entered upon his duties as State Highway Commissioner of Ohio on April 1.

RECENTLY APPOINTED STATE HIGHWAY OFFICIALS

EDWIN DUFFEY
State Commissioner of Highways of New York (Left).

CLINTON COWEN
State Highway Commissioner of Ohio (Right).

Street Work in Reading, Pennsylvania

The city of Reading, Pa., will spend about $123,000 for street work during the present year. Of this amount, $60,000 will be used for new paving, $28,000 will be expended for labor on highway repair work and $35,000 for materials for highway repairs.

Included in the work to be done are the following: Perkimen Ave., from 11th St. to the city line, removal of badly worn brick pavement and resurfacing with bituminous concrete; Cotton St., between 9th and 10th Sts., brick pavement; Washington St., between 2nd and 4th Sts., brick; Spruce St., between 2nd and 3rd Sts., Belgian block; Court St., between Front and 2nd Sts., brick; Spring St., between 9th and 10th Sts., bituminous concrete; 8th St., between Douglass and Spring Sts., brick.

The $60,000 required for new paving is to be raised by bond issues.

Proposed Highway Work Near New Orleans, Louisiana

A highway approximately 18 miles long, extending from the city limits of New Orleans, La., to Chef Menteur, will be completed at an early date by the Louisiana Motor League, according to a recent report. The highway has been constructed during the past five years, but only about one-third of it is surfaced. It is the intention now to surface the remainder with lake shells at an estimated cost of $25,000. The section to be improved is loamy earth, well drained and crowned, and has been kept in excellent condition.

It is also planned to construct a new section of road from the Chef Menteur Road to the Rigolets, a distance of 12 miles. Chef Menteur and the Rigolets are two watercourses connecting Lake Borne and Lake Ponchartrain. Chef Menteur is about 1,000 ft. wide and 40 ft. deep and the Rigolets about 2,000 ft. wide and 60 ft. deep. The plans include the ultimate building of drawbridges across both waterways, but transfer boats will be used for the time being.

The right of way between the watercourses is over marsh land which is subject to storm or extraordinary tidal overflow. It is therefore planned to build an embankment with an average height of 10 ft. and a width at the crown of 30 ft. This will place the roadbed 4 ft. above the highest known storm water elevation. It is estimated that the embankment will embrace about 600,000 cu. yds. of earth. The cost of the improvements, including the completion of the present Chef Menteur Road, and the construction of drawbridges, will be about $250,000.

Proposed Road Work in West Virginia

According to a statement made by State Road Engineer A. D. Williams, the State of West Virginia will spend about $4,000,000 for the construction and improvement of roads during the present year.

Bond elections will provide about 50 per cent. of this amount and the regular road levies will take care of the remainder. A road camp of 50 prisoners is soon to be established in Fayette County.

Tangipahoa Parish, Louisiana, is to Expend $50,000 for the construction of an improved highway system. Part of the $50,000 was originally intended to be applied to the indebtedness of the parish, but upon finding that this could not legally be done the Police Jury has decided to use the whole amount on road work. It is expected that work will be commenced in the near future.

AMERICAN ROAD BUILDERS' ASSOCIATION

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Through the courtesy of the publisher of "Good Roads," this page, each month, is devoted to the use of the American Road Builders' Association. It is solely in the interests of the Association, and it is the desire of the Executive Committee that all members feel that this space is their own, and that they contribute freely to it, not only as regards anything concerning the Association itself, but also that which will further the good roads movement. Besides the official announcements of the Association, there will appear on the page contributions by members, items of news concerning the Association activities and personal notes about its members. All contributions should be sent to the headquarters of the Association at 150 Nassau Street, New York, N. Y.

Executive Committee:
Nelson P. Lewis
A. W. Dean
E. L. Powers

Death of S. Percy Hooker

S. Percy Hooker, State Superintendent of Highways of New Hampshire, died at the New York Hospital, New York, N. Y., Saturday, March 24.

Mr. Hooker, who was in his fifty-fifth year, was born in Black Earth, Wis., and graduated from Philips Exeter Academy in 1879. He was engaged in business with his uncle at Le Roy, N. Y., until 1893, when he went to Arizona as manager of several mining properties. Later he returned to New York State and in 1902 was elected to the General Assembly from Genesee County. In 1906 Mr. Hooker was elected to the New York State Senate, serving there until 1909.

He first became identified with highway work when he was appointed a member of the New York Commission of Highways by Governor Charles E. Hughes, in 1909. He served on that commission until it was legislated out of existence upon a change in administration. Later he was appointed State Superintendent of Highways of New Hampshire, serving in that capacity until his death.

Mr. Hooker was a Mason, a member of the City Club of New York City and a director in the Bank of Le Roy and in the Le Roy National Bank. He was elected Third Vice President of the A. R. B. A. at the last election. He is survived by his widow and a daughter.

Meeting of the Board of Directors

The meeting of the Board of Directors, which was announced on this page in the issue of April 3, was held at New York, N. Y., on Saturday, April 10.

The first business coming before the board was the election of two members to act with the Secretary as an Executive Committee, as provided by the constitution. First Vice President A. W. Dean and Past President Nelson P. Lewis were elected.

The next matter taken up was the election of three directors to fill vacancies on the board occasioned by the recent amendment to the constitution providing that the five Past Presidents should be members of the board. As three of these Past Presidents, Samuel Hill, Harold Parker and Nelson P. Lewis, were members of the Board of Directors, their transfer resulted in three vacancies. W. E. Atkinson, State Highway Engineer of Louisiana, was elected a director to fill the vacancy created by the transfer of Past President Samuel Hill; T. R. Agg, Professor of Highway Engineering, Iowa State College, was elected to succeed Harold Parker, and Walter G. Leininger, Superintendent of Streets of Chicago, to succeed Nelson P. Lewis. The terms of Mr. Atkinson and Mr. Agg will expire in 1917 and that of Mr. Leininger in 1916.

President Tillson announced the appointment of Nelson P. Lewis, William H. Connell and R. H. Gillespie as a committee to audit the books of the Secretary and Treasurer and report to the Association upon a suitable accounting system.

A brief outline of the work done by the Executive Committee of the Pan-American Road Congress was given by Major Crosby and Mr. Powers, the two representatives of the A. R. B. A. on that committee.

The Chicago Convention

Editor, "Road Builders' Page":

I should like to thank my friends, Mr. E. L. Powers, Major W. W. Crosby and the Committee of the A. R. B. A., for the courtesy and kindness shown me during my visit to Chicago in December last.

I visited America to attend the Convention and see the Exhibition; but confess my first impressions after signing my name on the register at the entrance to the Exhibition were disappointing, as I thought I saw everything there was to see in the little square immediately in prospect, with the various state exhibits, model roadways and the steam shovel outside. I studied these and then went to look for Mr. Powers. During my search through unpretentious byways I came across the entrance to the Machinery Annex. What a surprise! I had only been in the entrance to the Exhibition!

After exploring both annexes I was struck by the comprehensive nature of the exhibits and felt it was worth coming 4,000 miles to see.

Of course when one thinks of the huge future for road construction in America compared with road surfacing and maintenance in the United Kingdom, one feels that it is unfair to make comparisons between exhibitions in the respective countries. I was particularly impressed by the thorough way in which America is tackling this great problem. In your country where there are such extremes in climatic conditions, the subject is most interesting, if only because of its wide and varied nature. You have also, I might say, a chance of making a clean start in road construction, while, in the United Kingdom our roads are a legacy left us by our forefathers, embodying a huge capital expenditure, interest on which we still pay.

While expressing my views in this way I do not pretend to belittle our home roads, as this great system of communication is one of our greatest national assets, of which we are very proud. We have to consider the best means of obtaining a good wearing surface kindly to the feet of man and beast, able to withstand modern traffic as long as possible without repairs, and easily repaired when required. This I think is also the aim of your country, but on the other hand we have to do this work on our existing roads with their varying widths, windings, steep gradients, sharp and blind corners, and so forth (although these very defects make our highways and byways famous for their charm), while you have the actual roads to construct, with the world's knowledge up to 1914 at your disposal in this branch.

You have grasped the problem in the proper scientific manner; you are training road engineers in your universities, I understand you are offering the finished student an attractive salary, and you have in your great country huge natural deposits of oil, bitumen and every class of road constructive materials.

I wish the A. R. B. A. and its kindred institutions every success in their earnest endeavors to enlist the sympathies of the American public in the good roads movement as exemplified by the Chicago Road Convention.

EBEN J. MORE.

Airdrie, Scotland.

A. R. B. A. Notes

Samuel D. Foster, for several years Chief Engineer of the Pennsylvania State Highway Department, has resigned.

H. L. Bowlby has resigned as State Highway Engineer of Oregon. Mr. Bowlby will be retained by the state to have charge of road work in Hood River County.

James R. Marker, whose resignation as State Highway Commissioner of Ohio, was noted in "Good Roads" for April 3, has accepted a position as Chief Engineer of the Ohio Paving Brick Manufacturers' Association, with headquarters at the Hartman Bldg., Columbus, Ohio.

Lucius E. Allen, C. E., of Belleville, Ont., presented a paper on "Bridges and Culverts" at the recent Second Canadian and International Good Roads Convention at Toronto, Ont. Through an error, Mr. Allen's name was omitted from the list of those presenting papers at that meeting which was printed on this page in the issue of April 3.

W. S. Fallis, formerly Highway Engineer in the Highway Division of the North Carolina Geological and Economic Survey, has been appointed State Highway Engineer of North Carolina by the State Highway Commission of that state. Mr. Fallis has been engaged in highway engineering in North Carolina for a number of years and has had charge of road work in a number of counties in that state.

D. H. Winslow, Superintendent of Road Construction, U. S. Office of Public Roads, is the originator of a plan for marking the Washington to Atlanta Highway, through Raleigh, N. C. The plan proposed by Mr. Winslow is to paint bands of red, white and blue on each telegraph or telephone pole along the road, 6 ft. above the ground. Each band is to be 6 ins. wide and the bands are to be separated from each other by unpainted spaces 1 in. in width.

William D. Uhler, formerly Principal Assistant in the Bureau of Highways and Street Cleaning of Philadelphia, Pa., has been appointed Chief Engineer of the Pennsylvania State Highway Department to succeed Samuel D. Foster, resigned. Mr. Uhler has been in the Philadelphia Bureau of Highways and Street Cleaning since the reorganization of that bureau was undertaken by Chief William H. Connell about three years ago. Mr. Uhler, who received a salary of $4,000 a year in Philadelphia, will receive $7,000 in his new position.

COMING MEETINGS

May 10-14.—Montana Society of Engineers.—Annual Convention, Butte, Mont.

June 1-3.—Conference of Mayors and Other City Officials of the State of New York.—Sixth Annual Meeting, Troy, N. Y. Secretary, William P. Capes, 105 East 22nd St., New York, N. Y.

June 7-9—National Conference on City Planning.—Conference, Detroit, Mich. Secretary, Flavel Shurtleff, 19 Congress Street, Boston, Mass.

June 22-26—American Society for Testing Materials.—Annual meeting, Atlantic City, N. J. Secretary, Edgar Marburg, University of Pennsylvania, Philadelphia, Pa.

August 2-6.—Tri-State Good Roads Association.—Third Annual Convention, San Francisco, Cal.

September 13-17—American Road Builders' Association and American Highway Association.—Pan American Road Congress, Oakland, Cal. Secretary, American Road Builders' Association, E. L. Powers, 150 Nassau St., New York, N. Y. Executive Secretary, American Highway Association, I. S. Pennybacker, Colorado Bldg, Washington, D. C.

The Pan-American Road Congress

As was announced in the issue of April 24, it was decided at a meeting of the Executive Committee of the Pan-American Road Congress, held in New York on April 16, to hold the congress at Oakland, Cal., during the week of September 13, this date having been selected because of the advantageous arrangements that could be made and also because it was felt that engineers planning to attend the International Engineering Congress could also attend the Pan-American Road Congress.

As was also announced in the previous notice, a suggestion has been made that one day be set aside by the exposition authorities as "Pan-American Road Congress Day," and it is believed that the suggestion will be carried out.

Another meeting of the Executive Committee was held in New York on April 26, at which there were present all of the members of the committee, which consists of Governor Charles W. Gates of Vermont, Chairman, and Messrs. W. W. Crosby, James H. MacDonald, J. E. Pennybacker and E. L. Powers. Progress reports made by the chairmen of the various sub-committees indicated very satisfactory progress in making arrangements for the meeting.

Among the measures adopted at the meeting was one providing for two classes of members at the Pan-American Road Congress—donor members and temporary members. Donor members will be those who contribute not less than $50, while the temporary members will be those who pay a fee of $2 each. Members of both classes will be entitled to participate in the proceedings of the congress and will receive copies of the printed proceedings. All members of either the American Road Builders' Association or the American Highway Association, in good standing on June 1, 1915, will have all the rights and privileges of temporary members and will be entitled to copies of the proceedings without further cost. The names of donor members will be printed in the advance and final programs, and each member of that class will also be entitled to nominate one temporary member for every $10 subscribed by him, temporary members so nominated to be accorded all the privileges of other temporary members and to receive the publications of the congress.

The next meeting of the committee will be held on May 10.

Conference of Governors at Chattanooga, Tennessee

A meeting which was designated as the Governors' Conference was held at Chattanooga, Tenn., on April 3, for the purpose of furthering the plans for the Dixie Highway. The opening meeting was preceded by three conferences of the governors present or represented, and the general meeting was very largely attended.

The Dixie Highway, which is being promoted by the Dixie Highway Association, the Chattanooga Automobile Club and various local organizations situated in the localities through which it will run, was originally planned to extend from Chicago, Ill., through the states of Illinois, Indiana, Kentucky, Tennessee, Georgia and Florida to Miami. The entire route has not yet been selected.

The governors of the six states directly interested were present or were represented and, in addition, the Lieutenant-Governor of Ohio was present and the Governor of Alabama was represented. At the conferences held by the governors or their representatives previous to the general meeting, resolutions were prepared for presentation to the meeting for the purpose of forming a permanent organization of the Dixie Highway Association and designating the manner of selecting a body to decide upon the route.

The morning session of the convention was opened by President W. R. Long of the Chattanooga Automobile Club. Judge Bancroft Murray acted as temporary chairman, being succeeded later by T. R. Preston, President of the Hamilton National Bank of Chattanooga, who acted as permanent chairman. Addresses of welcome were made by Governor Kye of Tennessee, on behalf of the state, and by Mayor Thompson of Chattanooga, on behalf of that city. After these addresses, others were made by the spokesmen from different localities, through which it is proposed to locate the route. The resolution previously referred to was presented to the meeting and was adopted. It was as follows:

Whereas, an association of individuals has organized the Dixie Highway Association for the purpose of constructing a permanent highway from a point on the Lincoln Highway, near Chicago, Ill., via Chattanooga, Tenn., to Miami, Fla., and

Whereas, the founders of this association have subscribed a sufficient sum of money to defray the expense of a permanent organization, secure surveys, maps, plans, etc., and

Whereas, said association has already expended considerable sums for this purpose, and has secured much data and many surveys, but has not yet sufficient data to finally determine the location of said highway at this time,

Therefore, be it resolved, by this convention of representatives from the states of Ohio, Indiana, Illinois, Kentucky, Tennessee, Georgia and Florida, known as the "governors' convention," that we hereby heartily approve and indorse the action of the Dixie Highway Association, in the movement to build the said Dixie Highway, and we hereby pledge to said Dixie Highway Association our most hearty cooperation and active support in pushing said enterprise to final completion.

Therefore, be it further resolved, that the governors of the states of Ohio, Indiana, Illinois, Kentucky, Tennessee, Georgia and Florida, be, and that they are hereby requested each to appoint two impartial representatives from their respective states as directors of the said Dixie Highway Association, who, with the seven incorporators of the association, shall constitute its first board of directors, the fourteen directors appointed by the governors as above provided to have full power to hear and determine all questions as to the location of the said highway and to locate the same.

It is distinctly understood that the right of said directors to designate any particular road in any state through which said highway may run as a part of the Dixie Highway shall not in any way confer upon said directors any authority in conflict with the duly constituted road authorities in the respective states through which said highway may run.

The seven incorporators referred to in the resolution are seven men who, previous to the main meeting, had applied for a charter under the laws of Tennessee. These men are C. E. James, W. R. Long, Richard Hardy, C. H. Huston, John A. Patten, M. E. Temple and T. R. Preston, all of Chattanooga.

Governor Ralston of Indiana, and other speakers, urged that federal aid should be extended in the building of the Dixie Highway, and the following resolution was adopted:

Whereas, the establishment of the "Dixie Highway" will prove of inestimable benefit to the government of the United States, be it.

Resolved, by the conference of the governors of the states of Illinois, Indiana, Ohio, Kentucky, Tennessee, Georgia and Florida, held this day in Chattanooga, Tenn., that the Congress of the United States be, and it is hereby requested, to furnish financial aid in the establishment and maintenance of the proposed Dixie Highway leading from Chicago, Ill., to Miami, Fla., and be it further

Resolved, that a committee of seven be appointed by the chairman of this conference to present this resolution to the Congress.

The following were appointed by Chairman Preston a committee to present the resolution to the Congress: James D. Richardson, Murfreesboro, Tenn.; Ex-United States Senator James B. Frazier, Chattanooga, Tenn.; H. A. Kealhofer, Secretary, Jacksonville (Fla.) Chamber of Commerce; Edwin L. Quarles, Lexington, Ky.; Peter Lee Atherton, Louisville, Ky.; Judge Mose Wright, Rome, Ga.; W. T. Anderson, Editor, Macon, Ga., "Telegraph."

GOVERNORS AND OTHERS AT CHATTANOOGA.
Left to Right: R. S. Kealhofer, Representing the Governor of Florida; Governor McCreary of Kentucky; Lieutenant-Governor Gordon of Ohio; Governor Slaton of Georgia; C. E. James; Governor Ralston of Indiana; Governor Rye of Tennessee.

The following resolution was also adopted by the conference:

Be it resolved, that it is the sense of this meeting that the commission to be appointed by the seven governors to locate the route for the Dixie Highway be asked to request the Director of the Office of Public Roads, at Washington, L. W. Page, to detail three highway engineers from his department to advise with and assist the governors in locating said highway.

The Board of Works of San Francisco, Cal., has decided upon street work to cost in the neighborhood of $88,000.

Commissioners of Montgomery County, O., have voted to issue $125,000 bonds for road improvement to be apportioned as follows: Cincinnati Pike, $65,000; Eaton Pike, $30,000; Old Troy Pike, $30,000.

The Authorities of Norfolk, Va., Have Awarded a Contract for paving 17 city streets to Louis Lawson of Norfolk, at his bid of $130,363.94. The contract carries a guarantee that the work will be completed by November 1.

The Following Officers have been Elected by the central committee in charge of the arrangements for "Good Roads Day" in Chester County, Pa.: Chairman, William H. H. Davis, East Bradford; secretary, C. F. Preston, West Chester; treasurer, S. Jones Philips. The celebration will take place on May 26.

REPORTS

AMERICAN HIGHWAY ASSOCIATION AND AMERICAN AUTOMOBILE ASSOCIATION; Proceedings of the Fourth American Road Congress at Atlanta, Ga., November 9-14, 1914. Paper; 6x9 ins., 361 pp. Published by the American Highway Association, Colorado Bldg., Washington, D. C. $1.00.

Included in the proceedings of the congress at Atlanta are the papers presented, the discussions, and accounts of the Women's Conference on Roads held in connection with the congress and of the annual meeting of the American Highway Association. It also includes a list of the officers and directors of the American Highway Association and a list of the principal executive officers of the American Automobile Association.

LACONIA, NEW HAMPSHIRE, BOARD OF PUBLIC WORKS; Annual Report for the Year Ending February 15, 1915, Reprinted from the Twenty-Second Annual Report of the City of Laconia, N. H. Paper; 6x9 ins., 40 pp.; illustrated.

Included in this are the reports of J. H. Story, Julius E. Wilson and John T. Dodge, the Board of Public Works; Charles A. French, Superintendent of Streets, City Engineer and Superintendent of Sewers, and the financial report of the Board of Public Works. The report of the Board of Public Works deals principally with recommendations for appropriations, etc.; the report of the Street Commissioner covers the street work of the city in detail, and the financial report of the Board of Public Works comprises a table showing the details of receipts and expenditures for street and other city work. The report contains one illustration, printed as a frontispiece, showing the Elm Street Bridge—a concrete structure completed early in 1914.

BOROUGH OF MANHATTAN, NEW YORK, N. Y.; Report of the President, for the year ending December 31, 1913. Paper, 7 x 10 ins., 186 pp.; illustrated; insets.

Included in this are the reports of H. W. Durham, Chief Engineer, Bureau of Highways; H. D. Appleby, Engineer in Charge, Bureau of Design and Surveys; J. H. Weinberger, Acting Engineer in Charge of Sewers, and Julian B. Beaty, Superintendent of Public Buildings and Offices. The illustrations consist of halftones showing public markets, baths, court houses and other buildings owned by the city, and organization charts. The insets consist principally of tables included in the appendices to the several reports. The report of the Bureau of Highways occupies 34 pages and is accompanied by 23 pages of appendices. It includes detailed data on the work done under the supervision of the bureau and discussions of various special phases of the work. The appendices contain a large amount of statistics relative to the work.

WISCONSIN HIGHWAY COMMISSION; Second Biennnial Report. Paper; 9x12 ins., 260 pp.; illustrated; insets.

This report, nominally for the two calendar years ending December 31, 1914, covers also work in 1912, this arrangement having been made, acording to the letter of transmittal, because of the incompleteness of the first biennial report as to construction in the calendar year of 1912. The contents include an introductory chapter discussing the general features of road work in Wisconsin, a statement of road work in each county, tables showing details of the work throughout the state, tables showing the details of the work in each county and various other tables, two of them printed as insets. The report is profusely illustrated by halftone reproductions of photographs showing various features of road work in the state and by reproductions of drawings showing road sections, bridges and culverts, etc. The report is well printed on paper of good quality, and is unusual because of its dimensions—9 by 12 ins.

NEW YORK DEPARTMENT OF EFFICIENCY AND ECONOMY; Annual Report to the Legislature for the year 1914, Concerning Matters Relating to the Construction and Maintenance of Public Highways. Cloth; 6x9 ins., 366 pp.; illustrated; insets.

This publication consists of the report of Arthur H. Blanchard, Consulting Highway Engineer, and Prevost Hubbard, Consulting Chemical Engineer, constituting the Advisory Board of the New York Department of Efficiency and Economy on the Construction and Maintenance of Public Highways. The report is divided into 13 chapters and is accompanied by fourteen appendices. The several chapter headings are as follows: Apportionment of State Funds for Construction of Highways; Financing the Maintenance of the Public Highways; Organization of the State Highway Department; Preliminary Investigations to Determine Suitable Types of Highways; Specifications Under Which New York Highways Have Been Constructed; Complete and Accurate Surveys Required for Correct Designing; Comprehensive Advertisements Necessary to Secure Competition; Defective Contracts Principal Cause of Poor Construction; Maintenance Contracts Inadequate in Regard to Work and Materials; Reorganization of Bureau of Tests Necessary to Secure Efficiency; Revision of Traffic Regulations to Protect State Highways; Valuable Data for Highway Commission in Other State Departments; Protection of Sources of Trap Rock Supply Needs Attention. The appendices deal with special problems of organization, special phases of the work, and specifications. The report is profusely illustrated by maps and charts showing roads and road systems, and by photographs showing unimproved and improved roads and roads under construction. Several of the maps and charts are printed as insets.

NEW PUBLICATIONS

LOCAL IMPROVEMENTS BY SPECIAL ASSESSMENT IN ILLINOIS, published by the Universal Portland Cement Co., Chicago, Ill. Paper; 6x9 ins., 48 pp.

This booklet comprises an outline of the procedure and forms for the construction of local improvements in cities, towns and villages of Illinois. The law of special assessments in that state, according to the introductory note, is very technical, and the publication is intended as a guide and not in any sense a substitute for the statutes or cases to which reference is made.

EARTH ROADS, by R. L. Morrison, Professor of Highway Engineering, Agricultural and Mechanical College of Texas. (Bulletin of the Agricultural and Mechanical College of Texas.) Paper; 6x9 ins., 20 pp.; illustrated.

This is printed as the February (1915) number of the Bulletin of the Agricultural and Mechanical College of Texas and comprises a brief treatise on the location, construction and maintenance of earth roads. The illustrations consist of reproductions of photographs and drawings showing examples of road relocation, the use of various machines and implements and examples of properly and improperly built roads.

CLEANING OF ALLEYS, issued by the Department of Public Works of the City of Detroit, Mich. Paper; 6x9 ins., 16 pp.; illustrated.

A large edition of this pamphlet, printed in English, Polish, Hebrew and Italian, has been printed and distributed by the Department of Public Works throughout the city, its purpose being to enlist the aid of the general public in keeping the city's alleys clean. The text comprises an explanation of the methods followed by the department in the work of cleaning, and instructions to individuals relative to their cooperation with the department. It is illustrated by views showing well-kept and ill-kept alleys, garbage and ash receptables, and methods of cleaning.

ILLINOIS STATE HIGHWAY DEPARTMENT; Bulletin No. 6, "Dust Prevention," Including Specifications for Oils and Tars Used in the Surface Treatments for Various Types of Roads; prepared by Frank L. Roman, Testing Engineer, Illinois State Highway Department. Paper; 6x9 ins., 40 pp.; illustrated.

The general subject of dust prevention is treated under several heads including the formation of dust and its prevention on various kinds of roads. A large portion of the text relates to the prevention of dust on macadam, gravel and earth roads. The specifications for the materials to be used in each case are given with the discussion of that particular case. The illustrations consist of halftones showing roads of various kinds in good and bad condition and methods of repair, maintenance and dust prevention.

PERSONAL NOTES

L. E. Stevens, City Engineer of Grand Rapids, Mich., has resigned.

M. P. Neff, Assistant Engineer of the Department of Public Service of Cincinnati, O., died recently.

W. W. Marr, Chief State Highway Engineer of Illinois, has been elected Permanent Secretary of the Dixie Highway Association.

Frank H. Hamilton has been assigned as Commissioner of Streets and Improvements by the recently organized City Council of Springfield, Ill.

F. H. Dillon, an engineer of San Antonio, Tex., has been placed in charge of the road construction work in Maverick County for which $25,000 of bonds were recently issued.

Perry Shumaker has been appointed City Engineer of Xenia, O., to succeed Levi Riddell who resigned recently. Mr. Shumaker has been connected with the engineering staff of the Pennsylvania Railroad.

James B. Girand, has been appointed City Engineer of Phoenix, Arizona, vice G. S. Foster, resigned. Mr. Girand is a graduate of the Agricultural and Mechanical College of Texas and has been County Surveyor of Moore County, Tex., and City Engineer of Prescott, Arizona.

Samuel D. Foster, who recently resigned as Chief Engineer of the Pennsylvania Highway Department, has gone into private practice at Harrisburg, Pa. He will specialize on highway work. Mr. Foster was formerly in the United States Corps of Engineers. He served under the Isthmian Canal Comission as Engineer in Charge of Highway Improvements at Panama City, and also under the Cuban Government as Second Engineer in Charge of Highways in Havana Province.

BOOK NOTICES

TARRED GRANITE MACADAM: IS IT A FAILURE? Reprinted rom "The Sanitary Record and Municipal Engineering," of London, England. Paper; 4¾x7 ins., 84 pp. The Sanitary Publishing Co., Ltd., 55-56 Chancery Lane, London, W. C., England. Price, 1s. 4d. in the United States.

This book consists of editorial summaries constituting a review of the correspondence on the subject of tarred macadam which has appeared from time to time in "The Sanitary Record and Municipal Engineering," together with reprints of that correspondence. The authors of the letters include county, borough, urban and rural district surveyors and others. The book is of a convenient size, is well indexed and is of particular interest as presenting the views of various authorities engaged or interested in road work.

GOOD ROADS YEAR BOOK (1915); J. E. Pennybacker, Editor; Charles P. Light, Business Manager. Cloth; 8vo, x + 498 pp. American Highway Association, Colorado Bldg., Washington, D. C. $1.00 (5 copies for $4.00), postpaid.

This, the fourth edition of the Year Book, departs very little from the previous issues of the book, either in arrangement or character of matter. Its contents by chapter headings are as follows: General Review of Progress in Road Improvement During 1914; History of Road Building; Road Systems of Foreign Countries; State Aid Legislation; Local Road Legislation; Legislation Governing Local Bond Issues; Bond Issues for Road Improvement; Digest of Convict Labor Laws; Convict Labor for Road Improvement; Digest of State Civil Service Legislation Applicable to Road Officials; Digest of Automobile Registration Laws; Types of Roads; Road Maintenance and Repair; Dust Preventives; Highway Bridges and Culverts; Massachusetts Specifications for Highways; Highway Officials; State and U. S. Progress Reports; Highway Improvement in Canada; State Funds Available for 1915 Road Work; Approximate State Highway Funds Available for 1915 (Table); Cash Road and Bridge Expenditures, 1914 (Table); Patents Issued by United States Patent Office in 1914 Pertaining to Roads; Patented Methods of Road Construction; Treatises on Road, Bridge and Culvert Construction and Allied Subjects; Bulletins, Circulars and Documents; Reference List of Papers, Addresses and Magazine Articles Published in 1914; Highway Engineering Education; Trade Names; Office of Public Roads, United States Department of Agriculture; Road Associations; Mileage of Improved and Unimproved Roads (Table); Manufacturers; American Highway Association. Aside from the revision of a large portion of the book to bring it up to date, the principal change noted is the addition to the 1915 volume of the chapter entitled "Digest of State Civil Service Legislation Applicable to Road Officials" and the chapter entitled "Highway Improvement in Canada." Specifications for various types of road have also been added to the chapter entitled "Types of Roads."

NEWS NOTES

Voters in Several Townships of Chesterfield County, South Carolina, will decide the question of issuing bonds for road construction at an election to be held May 4. The enabling act provides that the bonds shall not exceed the following amounts in the townships named: Cheraw, $40,000; Court House, $40,000; Mt. Croghan, $30,000; Old Store, $25,000; Cole Hill, $20,000; Steer Pen, $23,000.

Contracts for Road and Bridge Work aggregating over $40,000 have been awarded in Calcasieu Parish, La. The Vinton-Sparks highway construction was awarded to W. A. Sutton of Vinton, at a price not to exceed $15,000; Hugh Walker secured the contract for the Sulphur-De Quincy highway for which $22,000 was appropriated and the Vincennes Bridge Co., will construct a drawbridge over Black Bayou at a cost of $6,400.

Directors of the Dixie Highway Association have been appointed by the Governors of Illinois, Indiana, Ohio, Kentucky, Tennessee, Georgia and Florida, in accordance with the resolution adopted at the Governors' Conference at Chattanooga, Tenn., an account of which is printed on another page of this issue. These appointees, together with the seven incorporators of the association, constitute the Board of Directors and are empowered to select the route of the so-called Dixie Highway. The appointees are as follows: Illinois—Chief State Highway Engineer W. W. Marr of the State Highway Department and Richard J. Finnegan of Chicago; Indiana—Thomas Taggart of the State Highway Commission, and Carl G. Fisher of Indianapolis; Ohio—Lieutenant-Governor Harry Gordon and George G. Harris of Cincinnati; Kentucky—Harry Hanger of Richmond and Claude Mercer of Breckenridge; Tennessee—Judge M. M. Allison of Chattanooga and A. M. Shook of Nashville; Georgia—W. T. Anderson, Editor of the Macon "Telegraph," and Clark Howell, Editor of the Atlanta "Constitution"; Florida—G. W. Saxon of Tallahassee and S. A. Belcher of Miami.

NEW MACHINERY AND APPLIANCES

Automobile Flusher

A street flushing machine which has just been placed on the market is shown in the accompanying illustration.

The machine consists of a 3½-ton Tiffin motor truck of conventional design, upon which is mounted a 900-gal. tank with devices for pressure flushing, pressure sprinkling or gravity sprinkling. The truck is driven by a 4-cylinder motor, located as in other motor trucks, while the power for flushing and sprinkling is supplied by a second 4-cylinder motor mounted at the rear and equipped with separate ignition and cooling systems but taking its gasoline supply from the tank supplying the automobile engine. The pump which this motor drives is of the centrifugal type, giving pressures up to 60 lbs. As the two motors are connected in no way, the operator can vary the speed of the vehicle without producing any effect upon the water pressure. All the controlling mechanism for governing the sprinkling and flushing, as well as the controls for the truck, are conveniently located at the operator's seat.

The two flushing nozzles are provided with universal ball and socket joints, enabling the operator to throw two streams on one side of the street or at any desired angle. These nozzles, as shown in the illustration, are placed well to the front of the machine and, therefore, their operation can be observed by the driver. The sprinkling nozzles are located at the extreme front and can be operated by pressure or by gravity. The tank may be filled in the ordinary way from a hydrant or standpipe, but if necessary the pump can be utilized to fill the machine from rivers or cisterns.

Some of the advantages claimed for the machine are its wide range of application, its convenience in cities where the water pressure is low and its small cost of operation and maintenance.

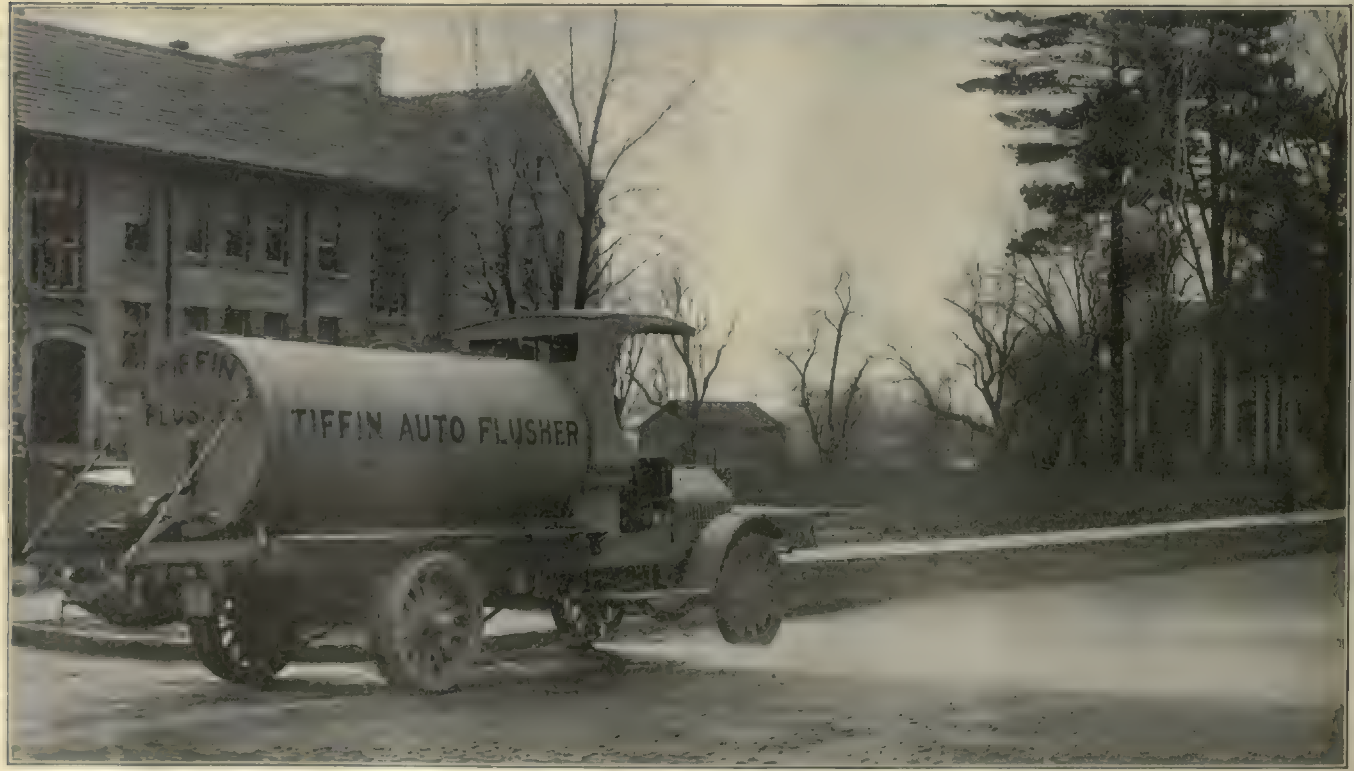
The machine, which is known as the Tiffin Auto Flusher, is manufactured by the Tiffin Wagon Co., of Tiffin, O.

Sand and Gravel Washer

The accompanying illustration shows a sand and gravel washer of a new type which has recently been put on the market.

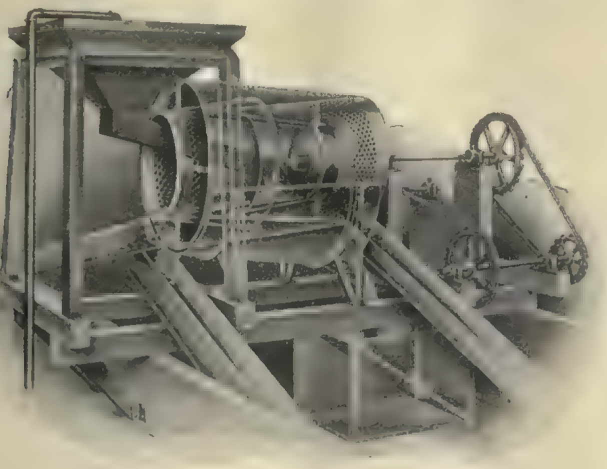
As shown by the illustration, the water and the gravel to be washed are placed in the hopper at the top, from which they are discharged through a chute leading to the upper end of the inner screen, the shape of which, like that of the others, is that of a frustum of a cone. This screen, having the largest holes, permits all but the largest particles to pass through, discharging the rejections to the upper of the two chutes shown at the left. The material which passes through falls on to the second screen, part of it first falling on a skirt extending over a part of the screen. It travels over the second screen, in the opposite direction to that followed on the first screen, the rejections being discharged to the chute at the right. The material passing through goes to the third screen, the larger particles being discharged to the lower of the two chutes at the left, while the material passing through is discharged into the settling tank at the bottom.

The special claims made for the machine are that its construction cost and the operating cost are low and that the output is large. The low cost of construction, it is claimed, is due to the compactness of the machine and the fact that it reduces the height of the plant, while the low operating expenses are due, according to the claims, to the comparatively small number of parts and the small height.



TIFFIN 900-GAL MOTOR PRESSURE FLUSHER AND SPRINKLER.

The machine is manufactured by the Biesanz Stone Co., of Winona, Minn. It was devised for use in that company's own business and was thoroughly tried out before being put on the market.



BIESANZ SAND AND GRAVEL WASHER.

NEWS OF THE TRADE

The Hart-Parr Co., Charles City, Ia., has opened a branch office and warehouse at 1417-19 West 10th Street, Kansas City, Mo. H. E. Henderson, former manager of the Denver branch, is in charge.

The Venezuela Coal, Oil & Asphalt Co. has been registered at Maracaibo, under the laws of Venezuela. According to a consular report, the capital is $386,000 and all supplies and machinery will be furnished by American firms.

The Bucyrus Company of South Milwaukee, Wis., has moved its southern sales office from Birmingham, Ala., to 1105 Hennen Building, New Orleans, La E. L. Byron, Southern Sales Manager, will remain in charge and will have associated with him R. S. Byron.

The Asbestos Protected Metal Co., of Pittsburgh, Pa., is distributing a 12-page booklet descriptive of the Pittsburgh paving joint. The booklet is 3½ by 6 ins. in size and is printed in black and green on buff colored paper. The booklet contains several halftones showing brick pavements, under construction and completed, in which the company's paving joint is used. It is exceptionally well printed and attractively gotten up.

The Allis-Chalmers Mfg. Co., Milwaukee, Wis., has issued an interesting booklet consisting of a series of halftones of the Allis-Chalmers tractor truck. The pictures show the truck in various kinds of service, most of them showing the flexibility of the truck and the action of the driving wheels. The booklet is 12 by 9 ins. in size and consists of 12 pages and covers. The ten illustrations of the truck are excellent halftones 7¼ by 5½ ins. in size.

"Furnace Slag in Concrete" is the title of a booklet recently issued by the Carnegie Steel Co., of Pittsburgh, Pa. The subject matter consists of descriptions of tests of blast furnace slag as an aggregate for concrete. Most of the data are arranged in the form of tables for convenient reference. Besides the results of the tests, there is included in the contents a description of the methods followed in making them. The booklet is 5 by 7½ inches in size and consists of 32 pages and covers.

"Clean Streets" is the title of a booklet recently gotten out by Studebaker of South Bend, Ind. The contents include descriptions of the Studebaker sprinklers, street sweeping machines, street cleaning carts, street flushers, dump wagons, pressure distributors and gravity road oilers, and a chapter occupying 16 pages on "How Some Cities Keep Clean." In this are described methods followed in Milwaukee, Wis., New York, N. Y., New Orleans, La., New Bedford, Mass., Detroit, Mich., Manhattan, Kan., Battle Creek, Mich., La Crosse, Wis., Newburg, N. Y., and other places. This chapter consists largely of extracts from articles published in various periodicals. There is also a chapter consisting of statistics on sprinking, sweeping, flushing and oiling. One 16-page section of the booklet is devoted to illustrations of Studebaker equipment, while the balance of the booklet is embellished by marginal illustrations. The booklet is 5 by 8 ins. in size and contains 80 pages.

In the action brought by F. Wm. Stocker, Inc., against Wm. E. Ficklen and Clara M. Ficklen in the Supreme Court of New York County, affecting the rights of the plaintiff under its license agreement covering certain patents for curb bars and expansion joints, a judgment was rendered on April 27 in favor of the plaintiff. It was held by the Court that the plaintiff had fully complied with the terms of its license agreement; that the notice of cancellation which Mr. Ficklen served upon F. Wm. Stocker, Inc., on July 2, 1914, is null and void, and that the license agreement is in full force and effect. It was further found by the Court that the defendants had interfered with the plaintiff in the carrying out of the license agreement by circulating among the trade reports reflecting upon the financial standing and credit of the plaintiff and upon its ability to carry out the contract. The judgment, in addition to declaring the license agreement in full force and effect, enjoins and restrains the defendants from making or issuing to any party or parties, other than the plaintiff, a license for the manufacture, sale or use of any of the articles covered by the patent and application for patent mentioned in the license agreement and from otherwise interfering with the plaintiff's business in carrying out its part of the license agreement so long as the plaintiff continues to perform its part thereof.

NEWS NOTES

The Common Council of Baton Rouge, La., has authorized the paving with gravel of approximately 13.5 miles of streets.

The Voters of Calhoun County, Tex., have approved a bond issue of $60,000 for the purpose of completing the road from the Victoria County line to within a mile of Seadrift.

A Road District is Being Planned at Jonesboro, Ark., under the new Arkansas law, an abstract of which appeared in "Good Roads," of April 17. The object of forming the district is to finance a gravel or concrete highway between Jonesboro and Otwell, a distance of about 15 miles.

At Lynchburg, Va., a Viaduct 1,800 ft. Long, which will eliminate five grade crossings, will be built at a cost estimated at over $200,000. Of this amount the city will contribute $50,000 and will construct the approaches. The remainder of the cost will be borne by the Southern Ry., and the Norfolk & Western and Chesapeake & Ohio R. R.s.

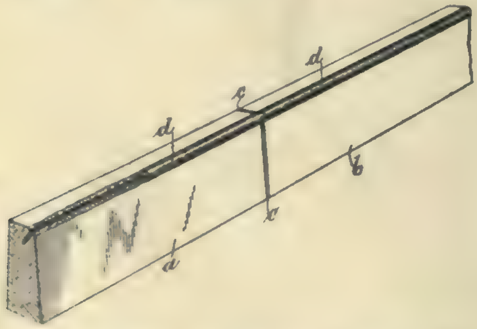
The City Council of Maryville, Mo., has decided to pave 13 streets aggregating 38 blocks. The streets are as follows: 5th St., Market to Dunn; Dunn, 5th to Normal; 9th, Mulberry to Normal; Thompson, Walnut to Main; 3rd, Frederick to Grand; Grand Ave., 3rd to Normal; Normal Ave., Grand to Dunn; Dunn, 2nd to 4th; Mulberry, 9th to 12th; 12th, Mulberry to Walnut; Walnut, 1st to 9th; Market, 3rd to Jenkins; Jenkins, Market to Main.

RECENT PATENTS

The following list contains the numbers of the principal patents relating to roads and pavements and to machinery used in their construction or maintenance which have recently been issued, together with the names and addresses of the patentees, dates of filing, serial numbers, etc. In some cases the principal drawing has also been reproduced. Printed copies of patents listed may be obtained for 5 cts. each by application to the Commissioner of Patents, Patent Office, Washington, D. C.

1,131,755. SPRING LATCH FOR WHEELED SCRAPERS. Harrison B. Walton and Jeff M. Estes, Levee Camp, Miss.; said Estes assignor to said Walton. Filed Jan. 28, 1913. Serial No. 744,631. (Cl. 37-33.)

1,131,793. COMPOUND FOR TREATING ROAD SURFACES. Walter J. Reynolds, Providence, R. I. Filed Sept. 22, 1910. Serial No. 583,307. (Cl. 134-1.)



1,131,872. PERISHABLE DIVIDING PLATE. Florian William Stocker, Hoboken, N. J. Filed Oct. 12, 1914. Serial No. 866,207. (Cl. 94-1.)

1,131,902. ROTARY ROAD GRADER. Creno P. Bettenga, Wadena, Minn. Filed Nov. 7, 1913. Serial No. 799,723. (Cl. 37-17.)

1,132,077. GUARD RAIL. Harry E. Dillon, Olean, N. Y. Filed Mar. 9, 1914. Serial No. 823,437. (Cl. 256-19.)

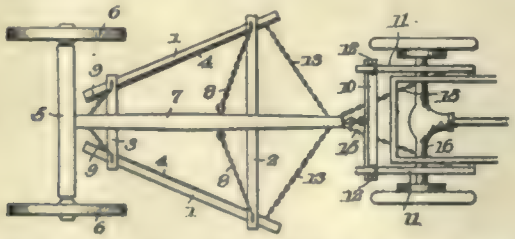
1,132,338. WAGON LOADING APPARATUS. George Haiss, New York, N. Y. Filed June 10, 1914. Serial No. 844,200. (Cl. 193-6.)

1,132,487. TRAIL GRADER. Arthur W. Phillips, Portersville, Cal. Filed Feb. 18, 1914. Serial No. 819,510. (Cl. 97-40.)

1,132,544. TRANSMISSION BEARING FOR ROAD ROLLERS. Andrew W. Aitken, Chicago, Ill., assignor to Austin Mfg. Co., Chicago, Ill., a corporation of Illinois. Filed Dec. 10, 1913. Serial No. 805,667. (Cl. 64-10.)

1,132,720. EXCAVATING MACHINE. Elias E. Hubbard, Harrisburg, Ill., assignor, by mesne assignments, of one-half to Herbert E. Mott, Harrisburg, Ill. Filed Jan. 22, 1914. Serial No. 813,724. (Cl. 37-24.)

1,132,821. RAILROAD CROSSING GATE. Edward Adams and Charley Niemitalo, Belden, N. D. Filed April 14, 1914. Serial No. 831,852. (Cl. 39-43.)



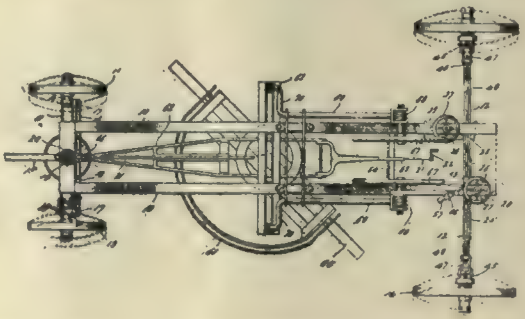
1,133,094. ROAD SCRAPER. Ward S. Bunker, Biloxi, Miss. Filed May 9, 1914. Serial No. 837,511. (Cl. 37-5.)

1,133,101. STONE CRUSHER. Joseph H. Cockfield, Cedar Rapids, Ia. Filed May 7, 1914. Serial No. 837,056. (Cl. 83-53.)

1,133,301. DUMPING WAGON. John J. McGuire, New York, N. Y. Filed May 10, 1913. Serial No. 766,747. (Cl. 21-20.)

1,133,721. SAND WASHING AND GRADING APPARATUS. William E. Gregg, Ford City, Pa. Filed Aug. 23, 1912. Serial No. 716,720. (Cl. 83-82.)

1,133,875. TRUCK FOR ROAD LEVELING MACHINES. Nathaniel S. Monroe, Arthur, Ill. Filed July 17, 1913. Serial No. 779,439. (Cl. 21-139.)



1,133,251. GRADER. Roy E. Adams, Indianapolis, Ind. Filed June 12, 1912. Serial No. 703,126. (Cl. 37-49.)

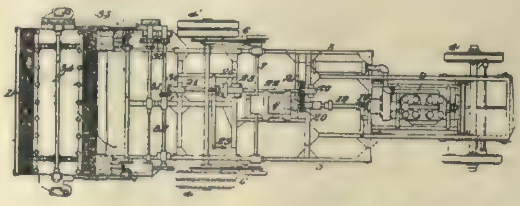
1,133,876. ROAD WORKING MACHINE. Nathaniel S. Monroe, Arthur, Ill. Filed Dec. 19, 1913. Serial No. 807,649. (Cl. 37-5.)

1,133,877. ROAD WORKING MACHINE. Nathaniel S. Monroe, Arthur, Ill. Filed Mar. 12, 1914. Serial No. 824,161. (Cl. 37-5.)

1,133,941. SIDE LOADER FOR CONCRETE MIXING MACHINES. Herbert C. Dilliard, East Bangor, Pa. Filed May 19, 1914. Serial No. 839, 574. (Cl. 214-3.)

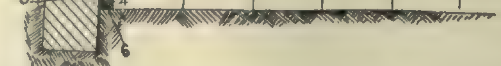
1,134,300. CONCRETE MIXER. Charles H. Vinal, Appleton, Wis. Filed June 13, 1914. Serial No. 844,939. (Cl. 83-73.)

1,134,306. CONCRETE PAVEMENT. Elbert F. Wilcox, Kansas City, Mo. Filed Feb. 16, 1914. Serial No. 818,827. (Cl. 94-1.)

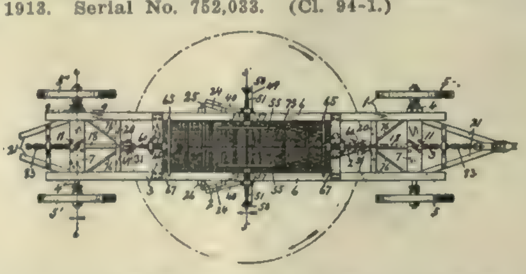


1,134,586. STREET SWEEPER. Charles H. Butler, Oakland, Cal. Filed Aug. 25, 1914. Serial No. 858,549. (Cl. 15-17.)

1,134,778. CULVERT FORM. Leroy Hiller Towner, Muskogee, Okla. Filed Mar. 3, 1914. Serial No. 822,148. (Cl. 25-131.5.)



1,134,939. PAVING STRIP. James Banwell, Cleveland, Ohio, assignor of one-third to Robert L. Beck, Cleveland, Ohio. Filed Mar. 5, 1913. Serial No. 752,033. (Cl. 94-1.)



1,134,945. SCARIFIER. David B. Cook, Frankfort, N. Y., assignor to Acme Road Machinery Co., Frankfort, N. Y., a corporation of New York. Filed Aug. 29, 1912. Serial No. 717,810. (Cl. 37-50.)

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Copy for advertisements of which proofs are to be submitted to advertisers should reach the New York office as follows: For insertion in the first issue of the month, by the fifteenth of the preceding month; for other issues, by noon on Thursday of the week before date of issue.

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State of Iowa Adopts New Law for Paving Assessments

The Farr Paving Law, which was recently signed by the Governor of Iowa, permits cities to create paving districts and assess property owners according to the benefits derived. Heretofore cities have been able to assess only such property as was within 300 ft. of the improvement. The act applies to corporations having a population of 2,000 or more and gives them power to construct and repair such pavements as their councils may decide upon, after citizens and property owners have been given a hearing.

Upon completion of an improvement, a tax of not more than 1 mill may be levied upon all taxable property for a term of not more than 10 years, to pay that portion of the cost not met by special assessments against the property in the paving district. These special assessments may not exceed 25 per cent. of the value of the property.

The new law will make possible the paving of streets between the centers of cities and the city limits, streets that are not infrequently in worse condition than roads situated wholly without the city limits.

Pennsylvania Automobile Fees.

The Supreme Court of Pennsylvania has decided that automobile license fees collected by the State Highway Department may be spent by it for maintenance.

This decision, which was rendered on appeal, upholds the decision of the County Court of Dauphin County. The fees received since the passage of the motor license law in Pennsylvania, amount to more than $1,000,000.

Proposed Charter Amendments in Kansas City, Missouri

In order to facilitate the performance of street improvement in Kansas City, Mo., the Municipal Paving Commission has suggested a number of amendments to the city charter which it is proposed to submit for public approval.

Among other things, the Commission recommends that all paving projects originate with the Board of Public Works, which shall be empowered to make repairs without the consent of the Council and that a two-thirds vote of the Council shall be necessary to kill paving ordinances.

The Commission also recommends that the revenue from vehicle licenses be transferred from the Park Board to the city treasury, to be used for repairs to pavements and that contractors shall be paid in cash, the city to provide for the taking up of special tax bills instead of requiring contractors to discount them, as at present.

It is further suggested that the maintenance period be changed from three to five years, that the city repair at once all pavement openings and charge the expense thereof to the persons or corporations making the openings; that the selection of paving materials and the execution of contracts be left entirely with the Board of Public Works, and that the Municipal Repair Plant be placed under the supervision of the City Engineering Department.

Arrangements for "Good Roads Day" in Pennsylvania

In response to the proclamation of Governor Brumbaugh, designating May 26 as "Good Roads Day" in the State of Pennsylvania, steps have been taken by State Highway Commissioner Cunningham, Chief Engineer Uhler and First Deputy Highway Commissioner Hunter, who is at the head of the Bureau of Township Highways, to insure the cooperation of the State Highway Department's forces with those of the counties and townships.

Assistant engineers in charge of the districts throughout the state have been instructed by Chief Engineer Uhler to give all possible advice and encouragement to the movement and to authorize the use on township roads of all machinery and other equipment not required for state work.

In a circular letter addressed to the assistant engineers and county superintendents, First Deputy Commissioner Hunter cites the good work done on "Good Roads Day" a year ago and urges them to duplicate or, if possible, exceed the record then established.

Mr. Hunter has also sent a circular letter to the township supervisors urging them to seek any necessary information from the state officials in their respective localities.

In his proclamation designating May 26 as "Good Roads Day," Governor Brumbaugh says:

"All our citizens are personally interested in good roads and profit by their improvement and maintenance. The economic good of our people depends in a large extent upon the establishment of satisfactory means of access to the markets and market stations of the commonwealth."

After expressing the fullest sympathy with the movement, the Governor directs that each road supervisor in the state give the project his cordial support and call upon all men under his control to do the same and urges that all able-bodied citizens so arrange their affairs as to give the entire day to the improvement of the roads or, if this is not possible, to contribute a sum equal to the wages of a laborer on the highways. This is urged also upon the residents of cities, especially those owning automobiles, who are requested to go into the country and volunteer their services.

In various parts of the state civic organizations have appointed committees to cooperate with the officials and, in many instances, elaborate programs have been arranged. In no case, according to reports, has anything in the nature of a celebration been planned, the arrangements, on the contrary, calling for a day of useful work.

Convict Labor on Public Highways in Massachusetts

The Massachusetts Legislature has passed an amendment to the act relating to the improvement and repair of highways by the labor of prisoners, which considerably broadens the scope of the law.

Under the act as amended, county authorities may arrange with the State Highway Commission or with the officials of a city or town, to work prisoners from a jail or house of correction on any highway or public land. In all cases where prisoners are so employed, they shall be in the custody of the sheriff of the county in which the work is being done. Prisoners may also be employed on the improvement of waste or unused land owned by private parties, in which case, as also in the case of highway work, the county is to be paid a sum to be agreed upon.

Oklahoma Good Roads Federation Elects Officers

At the meeting of the Oklahoma Good Roads Federation held at Oklahoma City on April 19, officers were reelected as follows:

President, W. J. Milburn; First Vice President, Robert Campbell; Second Vice President, D. J. Norton; Secretary, Alfred Hare; Treasurer, F. L. Patton.

It was unanimously voted to hold the next meeting of the federation at Tulsa.

Proposed Road Work in Fulton County, Georgia.

The program of the public works committee has been adopted by the Board of County Commissioners of Fulton County, Georgia, with the result that paving, grading and repair work amounting to more than $350,000 has been authorized. The work will be done by convict labor and will cover practically the entire county outside of the city limits of Atlanta.

Clean-Up Week in New York City

The week ending to-day has been observed as Cleap-Up Week in the Boroughs of Manhattan, the Bronx and Brooklyn, New York City.

The three boroughs were divided into thirteen sanitary districts by the Department of Street Cleaning and a schedule covering these was carefully observed so that by the end of the week a large amount of extra work was completed with practically no disarrangement of the department's routine.

In a few instances some extra teams were hired, but most of the work was done with the department's regular men and equipment. The work in the Bronx and Brooklyn was in charge of the Deputy Street Cleaning Commissioners assigned to those boroughs.

May 20-21, "Good Roads Days" in West Virginia

May 20 and 21 have been designated "Good Roads Days" by Governor Henry D. Hatfield of West Virginia. The Governor's proclamation is, in part, as follows:

"The urgent need of better roads places us face to face with one of the greatest problems of this age, but, once solved, will result in the greatest good to the greatest number.

"There has come to me from various citizens a call to repeat the good work of last year. Therefore, I hereby set apart Thursday and Friday, May 20 and 21, for road working and declare them public holidays, requesting that all business be suspended as far as possible and that every able-bodied citizen labor upon the public highways."

Paving in Parkersburg, West Virginia.

The City Council of Parkersburg, W. Va., has authorized the expenditure of $87,481.60 for paving to be done during the present season. The amount will be taken from the $200,000 bond issue recently voted for the purpose. The money is apportioned among ten streets as follows:

Ann St., 2nd to 8th, $20,299.60; Murdock Ave., 8th to 13th, $16,540.50; 3rd St., Ann to Court Square, $5,259; Park Ave., 7th to 19th, $13,200.05; Lynn St., 14th to 19th, $11,498; George St., Mary to B. & O. R.R., $4,095.20; 19th St., Avery to Murdock, $5,197.10; Green St., 7th to 8th, $2,115.05; 8th St., Avery to Green, $3,044.20; Washington Ave., Oak to Plum, $6,232.90.

NEWS NOTES

Washington County, Tenn., has postponed the proposed $425,000 road bond election from May 15 to December 18.

The Belle Isle Bridge, conecting Detroit and Belle Isle, Mich., was practically destroyed by fire recently. The damage was estimated at $250,000.

A Special Election Will be Held at Cleveland Heights, O., on May 17, on the question of a boulevard and park system to cost between $75,000 and $100,000.

Governor Fielder of New Jersey has signed a bill authorizing Atlantic County to spend $300,000 on a boulevard between Atlantic City and Absecon.

Work in Multnomah County, Oregon, on the surfacing of 70 miles of roads under the recently approved bond issue of $1,250,000, is soon to be commenced.

The Office of the Department of Public Highways, in the Bronx Borough Hall, New York City, was damaged recently by the explosion of a bomb. No one was injured.

The County Commissioners of Pinellas County, Fla., have passed a resolution asking for a bond issue of $250,000 for the construction of a brick road from St. Petersburg to Tarpon Springs, Fla.

Cook County, Illinois, observed the recent Illinois "Good Roads Day" in an elaborate manner. There were speeches, an automobile parade and band concerts. The new concrete pavement on Milwaukee avenue was christened by Miss Virginia Poehlmann, who broke a bottle of champagne when Peter Reinberg, President of the Cook County Board, removed the last shovelful of earth covering from the concrete.

The National Highways Protective Society reports 38 persons, including 20 children, killed on the streets of New York City during the month of April. Of these 21 were killed by automobiles, 10 by trolley cars and 7 by wagons. The number of persons killed during April, 1914, was 45. In the State of New York, outside of New York City, 23 persons were killed on streets and highways during April and 5 persons met their deaths on railroad grade crossings. The New Jersey fatality list for April shows 17 persons killed by automobiles and trolley cars and 4 killed on grade crossings.

COMING MEETINGS

May 10-14.—Montana Society of Engineers.—Annual Convention, Butte, Mont.

June 1-3.—Conference of Mayors and Other City Officials of the State of New York.—Sixth Annual Meeting, Troy, N. Y. Secretary, William P. Capes, 105 East 22nd St., New York, N. Y.

June 7-9—National Conference on City Planning.—Conference, Detroit, Mich. Secretary, Flavel Shurtleff, 19 Congress Street, Boston, Mass.

June 22-26—American Society for Testing Materials.—Annual meeting, Atlantic City, N. J. Secretary, Edgar Marburg, University of Pennsylvania, Philadelphia, Pa.

June 25-July 1.—The County Councils Association (Great Britain).—National Road Conference and Exhibition, London, England. Organizing Secretary, G. Montagu Harris, Secretary of the County Councils Association; Business Manager, A. F. May, 13 Victoria Street, Westminster, S. W., London, England.

August 2-6.—Tri-State Good Roads Association.—Third Annual Convention, San Francisco, Cal.

September 13-17—American Road Builders' Association and American Highway Association.—Pan American Road Congress, Oakland, Cal. Secretary, American Road Builders' Association, E. L. Powers, 150 Nassau St., New York, N. Y. Executive Secretary, American Highway Association, I. S. Pennybacker, Colorado Bldg, Washington, D. C.

October 11-15—National Paving Brick Manufacturers' Association—Annual convention, Dayton, O. Secretary, Will P. Blair, B. of L. E. Bldg., Cleveland, O.

National Road Conference and Exhibition in Great Britain

The National Road Conference and Exhibition, under the auspices of the County Councils Association of Great Britain, will be held at the Royal Horticultural Hall, Westminster, S. W., London, June 25 to July 1, concurrently with the annual meeting of the Institution of Municipal and County Engineers.

The County Councils Association is an organization comprising the councils of upwards of fifty counties of Great Britain. In the announcement of the conference sent out by that organization, various factors which make the road question of particular interest in Great Britain are pointed out. Among these are the large annual expenditure made on main roads, the increasing cost of maintenance, partly due to the injury done to the main roads by military traffic, and the plans for road improvement which have been made by various authorities to provide relief work in the event of unemployment anticipated as a result of releasing large bodies of men from temporary military service. The preliminary arrangements provide for the following sessions:

June 25-26.—Annual meeting of the Institution of Municipal and County Engineers. Discussion of the following subjects: (1) The improvement and maintenance of highways in connection with modern traffic conditions; (2) the use of reinforced concrete in buildings, road construction, etc.; (3) town planning; (4) haulage by mechanical means vs. horse power, from an economical point of view; (5) restriction and control of heavy traffic, both as regards weight and speed; (6) the maintenance and strengthening of iron and steel bridges.

June 28.—Conference on "The Adequacy of Bituminous Roads, with Special Reference to the Subject of Corrugations" and other matters.

June 29.—Conference on heavy traffic.

June 30.—Morning: Meeting of the Executive Council of the County Councils Association; Afternoon: Conference on the classification of roads.

July 1.—Conference on the reconstruction of roads in Belgium, arranged jointly by the County Councils Association and a special committee which has been formed in connection with the rebuilding of Belgium.

The exhibition will be divided into two parts. Materials and the lighter exhibits will be shown in the Royal Horticultural Hall, Westminster. The machinery will be shown on a site adjacent to the hall. It is announced that a large proportion of the available space has already been sold, the preliminary list of exhibitors including the following: Alexandra Paving Stone Co., Ltd.; Anglo-Mexican Petroleum Products Co., Ltd.; Barford & Perkins, Ltd.; Bristowe & Co., Ltd.; British Reinforced Concrete Engineering Co., Ltd.; Cambrian Granite Quarries, Ltd.; Clarmac, Ltd.; Continental Elastum Co., Ltd.; Emborough Stone Co., Ltd.; Enderby & Stoney Stanton Granite Co., Ltd.; R. A. Fraser, "Ferromac;" Gas Light & Coke Co.; Giant's Causeway Columnar Basalt Co., Ltd.; Hill's Patent Motor Vacuum Road Cleanser, Ltd.; W. H. Keys, Ltd.; Lacre Motor Car Co., Ltd.; Limmer Asphalte Paving Co., Ltd.; Marshall, Sons & Co., Ltd.; Pwllheli Granite Co., Ltd.; Roadamant, Ltd.; Robey & Co., Ltd.; "Rocmac," Ltd.; South Metropolitan Gas Co.; "Tarmac," Ltd.; Trinidad Lake Asphalte Paving Co., Ltd.; Webb Lamp Co., Ltd.; W. Weeks & Son, Ltd.; A. C. Wells & Co.

The Organizing Committee includes representatives from various bodies concerned with the construction and maintenance of roads.

The Organizing Secretary is G. Montagu Harris, Secretary of the County Councils Association; Francis Hyndman is Assistant Secretary, and the Business Manager is A. F. May, 13 Victoria St., Westminster, S. W.

On July 5 a good roads convention will be held at Springfield, Mo., under the auspices of the Greater Springfield Committee, of which John T. Woodruff is chairman. The Committee has for some time been working for good roads in Springfield and vicinity and it is reported that by the date of the meeting about 500 miles of roads will have been completed in Greene County, of which Springfield is the county seat, and in nearby counties.

The Society for the Promotion of Engineering Education will hold its twenty-third annual meeting at Ames, Ia., June 22-25. The sessions will be held in Engineering Hall, and besides the business and technical sessions there will be several entertainment features. Special provisions have been made for the accommodation and entertainment of such ladies as may attend, the new women's dormitory on the campus having been set aside for the accommodation of members accompanied by ladies.

The County Commissioners of Elkhart County, Indiana, have authorized the construction of 5 miles of brick highway between Goshen and Benton Township, at an estimated cost of $72,243.

Three West Virginia Counties will vote on road bond issues aggregating $1,235,000. The counties, amount of issues and date of elections are as follows: Cabell, $600,000, May 29; Kanawha, $375,000, May 29; Lincoln, $260,000, May 11.

The New Jersey Public Utility Board has ordered the Erie Railroad to eliminate 15 grade crossings in Paterson, N. J. Actual work must be started not later than Aug. 1, 1916, and must be completed within eight years. The cost is estimated at $3,000,000.

PERSONAL NOTES

F. O. Sinclair has been elected City Engineer of Burlington, Vt.

John B. Otto has been reelected City Engineer of Williamsport, Pa.

H. A. Perkins has been appointed City Engineer of Leavenworth, Kan.

Charles Fisher of Vinton, Ia., has been appointed County Engineer of Jackson County, Ia.

F. E. Burgess has been chosen Street Commissioner of Burlington, Vt., for a term of three years.

W. E. Dunn has been appointed County Engineer of Hardin County, Ia., to succeed S. B. Gardner, resigned.

Gaylord C. Cummin, City Engineer of Dayton, O., has been elected City Manager of Jackson, Mich., assuming office on May 1.

Arthur Capper has resigned as Assistant County Engineer of Dallas County, Ia., and has formed the Capper Engineering Co.

Harry D. Long, Superintendent of the Trenton, N. J., asphalt plant, died recently in the Mercer Street Hospital in Trenton.

C. U. Boley has been reappointed City Engineer of Sheboygan, Wis. He has served continuously in this position for 27 years.

W. F. Brooks, Highway Engineer in the United States Office of Public Roads, has been assigned to road work in several counties of Kentucky.

E. E. Schuets, former County Engineer of Marion County, Mo., has been appointed Assistant State Highway Commissioner of Missouri, vice Col. W. S. Hawkins, resigned.

James Ramsey who laid the first brick pavement in Topeka, Kan., died recently at his home in that city. He served as Street Commissioner of Topeka from 1895 to 1899.

Frank H. Villie, City Engineer of South Bethlehem, Pa., has resigned to resume private practice as consulting engineer. His offices are in the E. P. Wilbur Trust Co. Building, South Bethlehem.

R. O. Hollenbeck has been appointed assistant to First Deputy Highway Commissioner H. E. Breed of New York State, at a salary of $3,000. Mr. Hollenbeck has been Commissioner of Public Works of Middletown, N. Y.

Richard P. Harvey, formerly Manager of the Culvert Department of the Wheeling Corrugating Co., New York City, is now Western Representative of the Concrete Form Co., Inc., of Syracuse, N. Y., with offices at 225-227 Monadnock Building, San Francisco, Cal.

O. L. Remington, General Manager of Wm. McLean & Co., of Melbourne, Australia, and H. P. McColl, Engineer of the company, have recently arrived in the United States and have started on a trip through the country investigating methods, machinery and developments in the road building and other industrial fields.

NEWS OF THE TRADE

The Good Roads Construction Co., Chicago, Ill., has moved its offices from the Chamber of Commerce Building to 135 West Washington St.

The Standard Paving Co., Ltd., of Ottawa, Ont., has been incorporated in Canada, with a capital of $200,000, to take over the business of Foley & Gleeson, paving contractors.

The Paving & Construction Co., of Canada, Ltd., has been incorporated in Canada with a capital of $100,000. Bernard Brault, C. E., of Montreal, is one of the incorporators.

Connery & Co., Inc., of Philadelphia, Pa., are distributing booklets entitled "Specifications of Connery's Non-Leakable Welded Road and Roofing Kettles." The booklet consists of sheets, on each of which is described a heater or kettle made by the company, bound together and held in a brown paper cover in the manner in which specifications are commonly bound. The sheets also carry illustrations of the equipment described. The illustrations are excellent halftones and the booklet is very conveniently arranged.

The Koehring Machine Co., of Milwaukee, Wis., is distributing a mailing folder devoted to Koehring mixers. The inside of the folder carries a large illustration of the company's plant, at the top, beneath which is an illustration of the company's paving mixer with boom and delivery bucket. Smaller illustrations of various mixers manufactured by the company are arranged around the sides and the bottom of the page. Part of the other side of the folder is devoted to an illustration of the batch meter which is furnished on Koehring machines when desired. Another part carries an advertisement of the Koehring catalogue. Attached to the folder is an addressed mailing card to be filled out by those desiring information regarding particular models of the Koehring mixers.

The Heltzel Steel Form and Iron Works of Warren, Ohio, has commenced the construction of an addition to its present plant. It is stated that the addition will more than double the capacity of the company's plant. Up to this time the company has confined its business principally to lighter forms such as those for sidewalks, curbs, gutters and pavements and has engaged to a limited extent in the manufacture of sewer, wall and culvert forms. The plans are for a larger output of the heavier forms and it is also proposed to eliminate riveted forms entirely, a modern electric welding plant being one of the proposed improvements. The general office of the company will remain at Warren and the Cleveland office will be discontinued after 1915. Offices will be opened in New York, Pittsburgh and Chicago.

Florida City and Homestead, Fla., have voted to create a special road district and issue $100,000 of road bonds.

A $900,000 Bond Issue Recently Voted in Grayson County, Texas, will be used for the construction of 225 miles of roads, including a 100-mile belt road and 125 miles of laterals.

A Bond Issue of $100,000 for the improvement of roads in Oldham County, Ky., failed of adoption. A majority vote was cast in favor of the project, but the necessary two-thirds was lacking.

Hickman County, Ky., will hold another election on May 22 on the question of issuing $200,000 bonds for road improvement. The matter was defeated at a recent election, as mentioned in "Good Roads" for April 24.

GOOD ROADS

A Weekly Journal of Road and Street Engineering and Contracting

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The Contract System Versus Day Labor on Highway Work

As those familiar with highway work in Wisconsin are aware, much of the work done in that state under the supervision of the State Highway Commission has been done either by day labor or force account. The following discussion of that feature of highway work in Wisconsin is printed in the Second Biennial Report of the Wisconsin Highway Commision, which has recently been published:

"There has been some criticism of the fact that practically all of the state aid road construction has been done under the day labor or force account system, many citizens believing if the work were let by contract it would be done more cheaply, if not better done.

"The day labor system of doing the work has been adopted in practically all of the counties, due to the fact that there has not been (and is not now) even a reasonable number of contractors in the state who were able and willing to take state road contracts, or, even if they were willing, had the machinery, means and ability to carry them out.

"The circumstance which has most strongly operated against doing the work by contract has been the fact that, for the most part, comparatively small amounts were available for each separate piece of road work, the average amount available for each piece of construction (if a few counties were excepted) being about $1,500. With such small amounts available, it may readily be seen that competent contractors will not bid, especially if the work involves surfacing. The result has been that the work either had to be left undone or done by the county under the day labor system. When it was performed, no matter what the efficiency, due to the cost of moving and getting work started (which is the same for a $1,200 job as for a $12,000 job), the amount of actual road secured has in many cases seemed small.

"There seems to be no remedy for this condition until, either by legislative enactment or otherwise, the amount which may be expended on any one piece of road in any one year is made large enough to insure economical construction, whether it is done by day labor or by contract. The Commission believes that in 1914 every piece of work involving $10,000 or over was let by contract, and of the hundreds of other jobs besides these, probably not 20 had more than $5,000 available in one continuous piece.

"The Commission would recommend that the present dual system of letting work by contract whenever proper bids from competent contractors are secured, and doing the work by the day labor system when suitable bids can not be secured, be continued. The necessity of still further amending the state aid law so that work performed under it may be concentrated into operations of such size that really economical results may always be secured is called to the attention of the Legislature."

Development of Asphalt Beds in the Philippine Islands

The commercial development of extensive asphalt deposits in Leyte Province, P. I., is being undertaken by the Leyte Asphalt & Mineral Oil Co., of Tacloban, Leyte Province. The company has a capital of $150,000.

According to a report issued by the Department of Commerce, the supply of asphalt is practically inexhaustible. The deposits are located near the shore line at Tacloban, where vessels can anchor and receive cargoes from lighters loaded at the beds, with practically no overland transportation. The Leyte Asphalt & Mineral Oil Co. controls about 656 hectares lying close to the sea, but the vein ranges for about 15 miles along the coast.

The asphalt taken from the beds has been thoroughly tested and the Philippine Government has made extensive purchases for use in the islands. It is said to be almost pure near the surface and exceptionally pure at greater depths.

Governor Willis of Ohio Urges Highway Maintenance

Governor Willis of Ohio, in a recently issued statement, urges the proper maintenance of highways and advocates closer cooperation among federal, state, county and township road officials.

In reference to maintenance, Governor Willis says in part:

"It is certainly poor business method to expend thousands of dollars in the construction of roads and then allow them to go into decay, when the expenditure of a comparatively small amount would keep them in repair. A little defect in the surface of a highway, if not attended to promptly, will soon become a serious defect and ultimately will result in the destruction of the usefulness of the highway.

"Improvement and maintenance must not be neglected by our state, county and township officials. The work which has already been done at the cost of a vast sum of money must not be allowed to depreciate through neglect. It would be little short of a crime to allow the millions of dollars already expended in road building to be wasted through lack of proper attention. Nothing in nature or in human construction is permanent. The construction of roads should be under the supervision of the best informed engineers."

The Washington State Highway Commission's Plans for 1915 and 1916

The State Highway Commission of Washington has completed plans for $1,057,738 worth of state highway work during the present year and has outlined work to be done during 1916 which will cost, according to the official estimates, $870,440.

Some of the larger items in the 1915 program are the Sunset Highway, $238,272; the Pacific Highway, $216,000; the Inland Empire Highway, $136,058 and the National Park Highway, $116,816. In addition to these the following allotments have been made:

Olympic Highway, $97,125; McClellan Pass Highway, $35,000; secondary highways, $218,467. Included in the last named is an item of $104,016 for State Road No. 23 from Spokane to Newport. Of the total of $1,057,738 to be spent this year, $392,146 will be used on the east side of the Columbia River and $665,592 on the west side.

The work laid out for 1916 includes the following items:

Pacific Highway, $257,389; Inland Empire Highway, $115,872; McClellan Pass Highway, $112,795; National Park Highway, $108,700; Olympic Highway, $95,425; Central Washington Highway, $84,036; Sunset Highway, $72,719, and secondary highways, $54,950.

New York State Highway Contracts Let in Groups

The New York State Commission of Highways has adopted a plan of grouping repair contracts under which repairs to several roads in the same vicinity are placed under one contract. This is done in order to make a sufficiently large contract to warrant the installation of a more elaborate plant than could be employed profitably on small contracts, the theory being that with proper equipment the work can be done more quickly and thoroughly. Up to the present time, the largest contract covers about 30 miles.

Non-Resident Lecturers at Columbia University, New York City

The following non-resident lecturers have been appointed for the 1915-1916 session of the graduate course in highway engineering at Columbia University, New York City:

Charles J. Bennett, State Highway Commissioner of Connecticut; John A. Bensel, Consulting Engineer; Will P. Blair, Secretary, National Paving Brick Manufacturers' Association; Sumner R. Church, Manager, Research Department, Barrett Manufacturing Co.; Frederick A. Cleveland, Director, Bureau of Municipal Research, New York City; William H. Connell, Chief, Bureau of Highways and Street Cleaning, Philadelphia; Morris Llewellyn Cooke, Director, Department of Public Works, Philadelphia; Maj. W. W. Crosby, Chief Engineer, Maryland Geological and Economic Survey and Consulting Engineer; Charles Henry Davis, President, National Highways Association; A. W. Dow, Chemical and Consulting Paving Engineer; Edwin Duffey, Commissioner of Highways, New York State; Lewis R. Ferguson, Assistant Secretary, Association of American Portland Cement Manufacturers; C. N. Forrest, Chief Chemist, Barber Asphalt Paving Co.; Wilson P. Foss, Sr., President, New York Trap Rock Co.; Walter H. Fulweiler, Chief Chemist, United Gas Improvement Co.; E. P. Goodrich, Consulting Engineer; D. L. Hough, President, Cuban Engineering & Contracting Co.; William A. Howell, Engineer of Streets and Highways, Newark, N. J.; Nelson P. Lewis, Chief Engineer, Board of Estimate and Apportionment, New York City; Walter R. Marden, Vice President and Chief Engineer, United Construction Co.; H. B. Pullar, General Manager, Pioneer Asphalt Co.; Philip P. Sharples, Manager General Tarvia Department, Barrett Manufacturing Co.; Francis P. Smith, Chemical and Consulting Paving Engineer; George W. Tillson, Consulting Engineer to the President of the Borough of Brooklyn, N. Y.; John Cassan Wait, Attorney at Law; George C. Warren, President, Warren Brothers Co.

NEWS NOTES

An Election Will Be Held in Brooks County, Ga. May 29, on the question of issuing $400,000 road bonds.

The Department of Public Improvement of Omaha, Neb., has planned 15 miles of paving for this year. The cost is estimated at more than $1,000,000.

The Automobile Club of Ulster County, N. Y., has offered six cash prizes to be competed for by the patrolmen having in charge the maintenance of state and county highways in Ulster County.

The County Commissioners of King County, Wash., have awarded the contract for a brick highway between Renton and Orillia to the Washington Paving Co., of Tacoma, Wash. The company's bid was $56,000.

The Board of Supervisors of Colusa County, Cal., has decided to purchase an additional $120,000 of state road bonds for the purpose of building a section of the state highway between Colusa Junction and Delevan.

The House Committee on Appropriations of the Pennsylvania Legislature has recommended a grant of $15,000 for plans and estimates for the proposed William Penn Memorial Bridge across the Delaware River at Philadelphia.

San Bernardino County, Cal., has appropriated $25,000 to guarantee the state's share of the cost of building a bridge over the Colorado River at Needles, Cal. The United States Government and the State of Arizona will contribute $25,000 each.

The Michigan Appropriation Bill contains an item of $600,000 for state road work during the fiscal year beginning July 1. No appropriation is made for the succeeding year as it is believed the new motor vehicle law will yield upwards of $750,000 which will be used for road building.

A $260,000 Bond Issue for new bridges in Floyd County, Ga., failed of adoption recently. Although a majority of the voters favored the proposition, the necessary two-thirds vote was lacking. The County Commissioners have announced that the amount will be raised by direct taxation.

The Commercial Club of Sioux Falls, S D., has offered four prizes for road work, as follows: $50 for the best mile of dragged road within ten miles of Sioux Falls, $25 for the second best; $15 for the best half-mile of dragged road on any rural route out of Sioux Falls, $10 for the second best.

Director Cooke of the Department of Public Works, Philadelphia, Pa., has awarded paving contracts amounting to $103,131.58, the money for which will come out of a municipal loan of $11,300,000. The successful bidders were as follows: Barber Asphalt Paving Co., $34,044.84; Mack Paving & Construction Co., $32,060.76; McNichol Paving & Construction Co., $18,781.58; J. J. McHugh, $18,244.40.

PERSONAL NOTES

T. H. Landon has been appointed City Engineer of Alton, Illinois.

Lionel Ayres has been appointed City Engineer of Duluth, Minnesota.

J. W. Ward has been appointed City Engineer of Logansport, Ind.

F. O. Eichelberger has been appointed City Engineer of Dayton, O.

J. G. Cummings has been appointed City Engineer of Cranbrook, B. C.

E. H. Packard has been appointed City Engineer of Bloomington, Ill.

Edward Laubenstein has been elected Street Commissioner of Clarksburg, W. Va.

J. E. Buskirk has been reelected Commissioner of Streets of Hutchinson, Kan.

A. H. French, City Engineer of Brookline, Mass., died recently at his home in that city.

Louis K. Rourke, M. Am. Soc. C. E., has resigned as Commissioner of Public Works of Boston, Mass.

H. N. Beck, City Engineer of Muskegon, Mich., has been appointed City Manager of Grand Haven, Mich.

Le Roy Greenalch has been appointed City Engineer of Albany, N. Y., to succeed Alfred Kaufman, resigned.

Willis D. Leet, County Superintendent of Highways of Chautauqua County, N. Y., died recently at his home in Fredonia, N. Y.

E. V. Frothingham has resigned as Commissioner of Publis Works of the Borough of Manhattan, New York City, to take effect June 1.

J. A. Farrel, who was recently elected a city commissioner of Duluth, Minn., has been designated as Commissioner of Public Improvements.

John Wilson, City Engineer of Duluth, Minn., has resigned to reenter private practice. His offices are at 300 First National Bank Building, Duluth.

Patrick O'Hearn, formerly Building Commissioner of Boston, Mass., has been designated Acting Commissioner of Public Works of that city, vice L. K. Rourke, resigned.

R. Leslie Chiles has been elected Secretary of the Good Roads Commission of Knox County, Tenn., and has established permanent headquarters in the Court House at Knoxville, Tenn.

I. R. Ellison, Superintendent of the municipal electric light and water system of Eaton Rapids, Mich., has been placed in charge of the engineering work in connection with pavements to be constructed during the present season.

George A. Perkins, former Chairman of the Massachusetts Highway Commission, died recently in Boston, Mass. Mr. Perkins was a leader in the good roads movement and, as a member of the Massachusetts Legislature, introduced the first bill for the improvement of the state highways.

COMING MEETINGS

June 1-3.—Conference of Mayors and Other City Officials of the State of New York.—Sixth Annual Meeting, Troy, N. Y. Secretary, William P. Capes, 105 East 22nd St., New York, N. Y.

June 7-9—National Conference on City Planning.—Conference, Detroit, Mich. Secretary, Flavel Shurtleff, 19 Congress Street, Boston, Mass.

June 22-26—American Society for Testing Materials.—Annual meeting, Atlantic City, N. J. Secretary, Edgar Marburg, University of Pennsylvania, Philadelphia, Pa.

June 25-July 1.—The County Councils Association (Great Britain).—National Road Conference and Exhibition, London, England. Organizing Secretary, G. Montagu Harris, Secretary of the County Councils Association; Business Manager, A. F. May, 13 Victoria Street, Westminster, S. W., London, England.

August 2-6.—Tri-State Good Roads Association.—Third Annual Convention, San Francisco, Cal.

September 13-17—American Road Builders' Association and American Highway Association.—Pan American Road Congress, Oakland, Cal. Secretary, American Road Builders' Association, E. L. Powers, 150 Nassau St., New York, N. Y. Executive Secretary, American Highway Association, I. S. Pennybacker, Colorado Bldg, Washington, D. C.

October 11-15—National Paving Brick Manufacturers' Association—Annual convention, Dayton, O. Secretary, Will P. Blair, B. of L. E. Bldg., Cleveland, O.

October 11-15—American Society of Municipal Improvements—Annual convention. Dayton, O. Secretary, Charles Carroll Brown, 702 Wulsin Building, Indianapolis, Ind.

November 17-19—National Municipal League—Annual convention. Dayton, O. Secretary, Clinton Rogers Woodruff, 705 North American Building, Philadelphia, Pa.

The Pan-American Road Congress

The proposal of the authorities of the Panama-Pacific International Exposition to designate September 15 as "Pan-American Road Congress Day" was accepted at a meeting of the Executive Committee of the Pan-American Road Congress held at New York, N. Y., on Monday of this week. At that meeting progress reports were made by the several sub-committees, and further preparations for the congress, which will open on September 13, were made.

Among the men prominently connected with the good roads movement who will be asked to preside over the sessions of the congress are: Governor Charles W. Gates of Vermont; Logan Waller Page, Director, U. S. Office of Public Roads; Col. Wm. D. Sohier, Chairman, Massachusetts Highway Commission; George W. Tillson, Consulting Engineer to the President of the Borough of Brooklyn, New York, N. Y.; Fairfax Harrison, President, Southern Railway Co.; James H. MacDonald, former State Highway Commissioner of Connecticut, and W. A. McLean, Chief Engineer of Highways and Commissioner of the Ontario Public Roads and Highways Commission.

Included among the men prominent in highway work who will be asked to present papers or open discussions are the following: Arthur W. Dean, Chief Engineer, Massachusetts Highway Commission; Charles J. Bennett, State Highway Commissioner of Connecticut; Nelson P. Lewis, Chief Engineer, Board of Estimate and Apportionment, New York, N. Y.; H. Elting Breed, First Deputy Commissioner, New York State Highway Commission; Col. Edwin A. Stevens, State Commissioner of Public Roads of New Jersey; Wm. D. Uhler, Chief Engineer, Pennsylvania State Highway Department; Wm. H. Connell, Chief, Bureau of Highways and Street Cleaning of Philadelphia, Pa.; S. E. Bradt, Secretary, Illinois State Highway Commission; Thomas H. MacDonald, State Highway Engineer of Iowa; W. E. Atkinson, State Highway Engineer of Louisiana; Richard Henry Dana, President, National Civil Service Reform League; W. S. Keller, State Highway Engineer of Alabama; Austin B. Fletcher, State Highway Engineer of California; W. R. Roy, State Highway Commissioner of Washington; Frank F. Rogers, State Highway Commissioner of Michigan; Dr. Joseph Hyde Pratt, Secretary, North Carolina State Highway Commission; A. N. Johnson, Road Engineer, Bureau of Municipal Research, New York, N. Y.; George W. Cooley, State Engineer of Minnesota; E. R. Morgan, State Road Engineer of Utah; J. E. Maloney, Secretary-Engineer, Colorado State Highway Commission; W. S. Gearhart, State Engineer of Kansas; H. R. Carter, State Highway Engineer of Arkansas, and Lamar Cobb, State Engineer of Arizona.

Topics to be discussed will include, besides those covering the practical problems of road and street work, such important subjects as the following:

"Determination of Justifiable Outlay for Individual Roads;" "Convict Labor for Road Work;" "Street Pavements;" "Reconstruction of Old Surfacing;" "Load and Tire Restrictions and Regulations;" "Motor Traffic; Its Development and Trend;" "Maintenance, Methods and Materials;" "Dust Suppression and Street Cleaning;" "Uniformity in Highway Statistics and Data;" "Merit System in Highway Work;" "Essentials of Legislation Governing State Highways;" "Highway Indebtedness; Limitation and Regulation," and "Educational Work of Highway Departments."

American Society for Testing Materials

Several reports and papers on matters of interest to road builders will be presented at the eighteenth annual meeting of the American Society for Testing Materials at Atlantic City, N. J., June 22-26. Business sessions will be held at 11 a. m., 3 p. m. and 8 p. m., on Tuesday, June 22; at 10 a. m. and 8 p. m., on Wednesday, June 23, Thursday, June 24, and Friday, June 25, and at 10 a. m. on Saturday, June 26. The seventh session, at 3 p. m., on Thursday, June 24, will be devoted to cement and concrete; the eighth session, at 10 a. m., Friday, June 25, to ceramics, gypsum and lime, and the tenth session, at 10 a. m. on Saturday, June 26, to road materials, timber and rubber.

Among the reports and papers on cement and concrete are the following: Report of Committee C-1 on Standard Specifications for Cement—G. F. Swain, Chairman; Report of Committee C-9 on Standard Tests of Concrete and Concrete Aggregates—S. E. Thompson, Chairman; "Microstructure of Concretes," by N. C. Johnson; "The Effect of Finer Grinding and a Higher SO_3 Content Upon the Physical Properties of Portland Cement," by P. H. Bates; "Some Abrasive Tests on Portland Cement Mortars to Select Aggregates and Mixes for Concrete Highways," by H. S. Mattimore; "Method of Weight-Volumetric Proportioning of Concrete Aggregates in Testing," by J. A. Kitts.

Included in the reports and papers on ceramics, gypsum and lime are the following: Report of Committee C-3 on Standard Specifications for Brick—A. V. Bleininger, Chairman; Report of Committee C-4 on Standard Specifications and Tests for Clay and Cement Sewer Pipes—Rudolph Hering, Chairman; Report of Committee C-6 on Standard Tests and Specifications for Drain Tile—A. Marston, Chairman; "The Legal Interpretation of the Word 'Vitrified,' as Applied to Ceramic Products," by Edward Orton, Jr.; Report of Committee C-7 on Standard Specifications for Lime—J. S. Macgregor, Chairman.

The reports on road materials and timber are as follows: Report of Committee D-4 on Standard Tests for Road Materials—L. W. Page, Chairman; "Some Experiments on Technical Bitumens," by S. R. Church and J. M. Weiss; Report of Committee D-7 on Standard Specifications for Timber—H. Von Schrenk, Chairman; "A Fungus Bed Test of Wood Preservatives," by Cloyd M. Chapman.

New York Conference of Mayors

"Efficiency First" will be the title of the presidential address by President Cox of the New York State Conference of Mayors and Other City Officials at the opening session of the sixth annual meeting of that organization which will be held at Troy, N. Y., June 1, 2 and 3.

Among other speakers will be Corporation Counsel Arthur L. Andrews, of Albany; President George McAneny, of the Board of Aldermen of New York City; Comptroller William A. Prendergast, of New York City; Dr. Frederick Cleveland, of the New York Bureau of Municipal Research; State Health Commissioner Herman Biggs, and Judge Harry Olson, of Chicago.

One of the principal subjects which will be considered at the conference will be municipal finances. Another subject that will receive considerable attention is that of city planning. The city planning survey of the cities of the state has been completed by the conference's Advisory Committee of City Planning Experts, which will report at the last session. The report will be presented by Arnold W. Brunner, Chairman; Nelson P. Lewis, Chief Engineer of the Board of Estimate and Apportionment of New York City; Charles D. Lay, former Landscape Architect of New York, and D. L. Turner, Deputy Engineer of the New York Public Service Commission.

The South Texas Good Roads and Drainage Congress will meet at Houston, Tex., on May 26 and 27. The meeting will be under the auspices of the Progressive League and will be addressed by several speakers of national reputation. It is expected that delegates from 72 counties will be present.

Voters of Tulsa, Okla., have decided in favor of a $200,000 bond issue for a concrete bridge over the Arkansas River.

Daviess County, Ky., will hold an election June 22 on the question of a $600,000 bond issue for the purpose of building roads.

The Board of Supervisors of Orleans County, N. Y., has decided to improve Yates Center Road and the Fancher-Holley Highway at an estimated cost of $144,200.

The Construction of a System of Trunk Roads in Greenville County, South Carolina, is being arranged for. It is reported that the total cost of the work will be about $1,000,000.

Shasta County, California, has already bought $205,000 of state highway bonds and will purchase $325,000 more in order to complete the highway between Redding and Sims. This work will include the building of 18 bridges varying from less than 200 ft. up to 850 ft. in length.

The City Council of Youngstown, O., has authorized an $800,000 bond issue for the purpose of eliminating grade crossings at Himrod Ave., Oak St., Watt St., Walnut St., Champion St., Wick Ave., Phelps St., Hazel St., Holmes St., North Ave., Westlake's Crossing, Ardale St., and West Ave.

The County Road Commissioners of Berrien County, Mich., have forwarded to the Board of Supervisors a road building program for 1916. The plan contemplates the building of 50 miles of new highway and the completion of four principal highways connecting the north and south districts of the county.

Contracts have been let by the County Commissioners of Sullivan County, Ind., for the repair of 450 miles of gravel roads. The successful bidders were: the A. & C. Stone & Lime Co., Greencastle, Ind.; Merom Gravel Co., Merom, Ind.; Spencer Stone Co., Indianapolis, Ind., and the Summit Sand & Gravel Co., Terre Haute, Ind.

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Proposed $50,000,000 Loan for Road Improvements in Pennsylvania

The Pennsylvania Legislature is considering a bill to submit to the voters a proposition to create a loan of $50,000,000 for road improvement. The resolution is similar to that which was defeated by a small margin in 1913.

Senator William C. Sproul, of Delaware County, is sponsor for the bill, which provides that the question shall be submitted to vote at the regular election in November, 1918, the Pennsylvania Constitution providing that amendments of this sort shall not be resubmitted to the people oftener than once in five years. It is understood that the measure is favored by Governor Brumbaugh.

County Good Roads Associations Recently Formed in Alabama

The Alabama Good Roads Association is conducting an active campaign for the formation of county good roads organizations throughout the state and its efforts are meeting with considerable success.

The Dale County Good Roads Association organized recently and elected the following officers: President, G. P. Dowling; First Vice President, G. A. B. Edwards; Second Vice President, Dr. H. B. Dowling; Secretary, Dr. M. O. Grace; Treasurer, P. C. Steagall.

Another new organization is the Houston County Good Roads Association, the officers of which are J. R. Young, President; J. F. Faircloth, First Vice President; G. H. Malone, Second Vice President; Joseph Barker, Secretary, and John Sanders, Treasurer.

Increase in Proposed Highway Bonds in California

The California Highway Bond Act, which will be submitted to a referendum, has been amended to increase the proposed issue from $12,000,000 to $15,000,000. It is planned, if the measure is approved by the people, to apply the extra $3,000,000 to the following roads:

Extension connecting the interior and coastwise trunk lines through Trinity and Humboldt Counties; connecting the San Joaquin Valley trunk lines between Merced and Madera, through Pacheco Pass to Gilroy; extension of the Mariposa State Highway lateral to El Portal; extension connecting the San Joaquin Valley line in Tulare County with Monterey County by continuation of the lateral between Visalia and Hanford through Coalinga; extension connecting San Joaquin Valley line near Bakersfield with San Luis Obispo through Cholame Pass; extension of San Bernardino County state lateral to Barstow; extension connecting Antelope Valley with Los Angeles; extension of San Bernardino County lateral to Yuma.

More Than 50 Miles of Northern Ohio Roads to be Paved

State Highway Commissioner Clinton B. Cowen, of Ohio, recently awarded contracts for work on 51.71 miles of roads in Northern Ohio, at bids which aggregated over $600,000.

The work to be done, the names of the successful bidders and the figures at which the contracts were awarded are given below. In a few instances, alternate bids were received and contracts in such cases are conditional upon the decision of the local authorities.

Champaign County, Urbana-Sidney Road, 1 mile, concrete, Iliff Bros., London, $11,708. Defiance County, Hicksville-Defiance Road, 4.03 miles macadam, Richard Conway, Napoleon, $32,929.64; concrete, T. J. Connell, Cambridge City, Ind., $44,200. Fulton County, 1.05 miles macadam, H. G. Zeller, Swanton, $8,476.29. Harrison County, 1.59 miles macadam, R. L. Timmons, Cadiz, $11,995; ½ mile macadam, J. P. Warnick, Cadiz, $4,125. Highland County, 2.5 miles macadam, Ironton Transfer & Storage Co., Ironton, $15,592. Knox County, 2.05 miles brick, T. J. Connell, Cambridge City, Ind., $38,800. Medina County, 1.29 miles concrete, George S. Mellert, Medina, $13,489; 2.09 miles concrete, C. E. Wilson & Sons, Barnesville, $20,695. Monroe County, 1.3 miles brick, Ohio Valley Contracting Co., Cincinnati, $20,600; 1.17 miles brick, same contractor, $22,700. Paulding County, 2.01 miles macadam, R. C. Roach, Waterville, $10,585; concrete, Fitzmorris & Beard, Portland, Ind., $22,205; 1.96 miles macadam, Clemmer & Johnson, Hicksville, $15,139. Perry County, 1.66 miles brick, Toy & Milligan, Lima, $38,955. Portage County, 1.73 miles concrete, Miller Bros., Youngstown, $18,989.50; 3.16 miles concrete, Joseph Miller, Venedocia, $32,650. Putnam County, 1.97 miles macadam, Barnes & Almendinger, Rocky Ridge, $13,500. Richland County, 1.54 miles macadam, F. L. Rice & Sons, Shelby, $11,259; 2.95 miles macadam, Ohio Valley Contracting Co., Cincinnati, $23,000. Ross County, 1.52 miles concrete, Iliff Bros., London, $15,228.34; 1 mile concrete, J. F. Perry, Chillicothe, $11,918; brick, Brewer, Tomlinson & Brewer, Dayton, $13,746. Stark County, 1.57 miles brick, Lowenstein & Ule, Cleveland, $27,830. Summit County, 4.7 miles brick, J. C. Devine, Alliance, $11,631. Trumbull County, 2.5 miles slag, Ohio River Contracting Co., $21,000; stone, P. Mylott, Youngstown, $19,435; 1.83 miles, run of crusher, Frank M. Hannon, Niles, $16,010.45; stone, P. Mylott, $14,438; 0.18 mile brick, McDermott & Hannon, Niles, $3,600.

A Law for the Teaching of Road Building in Alabama Schools

A bill requiring the teaching of road building in all the county high schools, the several normal schools, the state agricultural schools, the State University and the Polytechnic Institute was passed by the Senate of the Alabama Legislature at its recent session. The House took no action on the bill and it is held for further action when the Legislature reassembles next July.

The bill requires that the several county high schools, the normal schools and the agricultural schools establish and teach a course of "civil engineering and practical and scientific road building" and that all male students in such schools receive instruction in such courses for a term of at least six weeks in each year. It provides also that the State University of Alabama and the Polytechnic Institute must give a similar course for a period of at least six weeks in each year to all male students in the freshman and sophomore classes. In addition, it is provided that the male students in the summer schools of the State University of Alabama and the Polytechnic Institute must be given a similar course each year, provided the students desire such instruction.

The bill was introduced by Senator W. H. Key, Chairman of the Senate Committee on Good Roads, at the request of the Alabama Good Roads Association.

Road Work in New Jersey

According to the twenty-first annual report of the Commissioner of Public Roads of the State of New Jersey, 102.046 miles of new roads were built under state aid during the fiscal year from November 1, 1913, to October 31, 1914, at a cost of $1,358,467.51, of which the state's share was $558,026.85.

Repairs paid for out of the motor vehicle fund amounted to $500,226.28, while repairs paid for out of county funds aggregated $1,455,241.19. This figure is only approximate, however, owing to the difficulty experienced in securing complete returns from the counties. State aid bridges to the amount of $29,854.17 were built during the fiscal year covered by the report.

MILEAGE OF ROADS BUILT DURING 1914 AND COST THEREOF AND TOTAL MILEAGE BUILT SINCE PASSAGE OF STATE AID LAW

County	1914 Mileage	Cost	Total Mileage
Atlantic	11.867	$30,907.01	134.058
Bergen	2.704	104,647.95	49,390
Burlington	11.595	55,967.77	221.657
Camden	8.070	139,638.22	118.554
Cape May	6.161	99,830.33	76.452
Cumberland	1.458	21,186.89	27.414
Essex	2.831	49,128.16	121.903
Gloucester	....	....	91.331
Hudson	....	....	5.545
Hunterdon	9.940	138,799.27	53,645
Mercer	....	....	143.308
Middlesex	4.958	96,451.52	*183.592
Monmouth	2.310	22,623.41	132.482
Morris	....	....	81.182
Ocean	5.420	50,599.26	106.285
Passaic	7.802	223,548.99	77.113
Salem	6.753	55,944.98	63.604
Somerset	....	....	104.578
Sussex	5.476	72,796.41	32.435
Union	4.038	66,110.20	44.439
Warren	10.663	130,287.14	66.130
Totals	102,046	$1,358,467.51	1,935.087

*Including 10.55 miles built in 1892.

Pennsylvania's "Good Roads Day"

May 26, as has been announced in a previous issue, will be "Good Roads Day" in Pennsylvania and the project is being given an unusual amount of publicity throughout the state.

State Highway Commissioner Cunningham, Chief Engineer Uhler and First Deputy Highway Commissioner Hunter are taking an active personal interest in the movement and Mr. Hunter, as head of the Bureau of Township Highways, has directed the forces of his department to cooperate with the township officials in every way possible.

One of the latest movements is to enlist the aid of women and children by urging them to supply luncheon and drinking water to the road workers.

In many towns, the day will be observed as a holiday and places of business will be closed in order to permit employes to work on the roads. This is in accordance with a suggestion in Governor Brumbaugh's proclamation.

NEWS NOTES

Calloway County, Kentucky, will vote on a $200,000 bond issue for good roads, on May 29.

The Voters of Carter County, Tennessee, have defeated a project to issue road bonds to the amount of $340,000.

The Mayor and Aldermen of Concord, N. H., have authorized an $86,000 bond issue for the construction of two bridges.

Contracts for Nine New Stone Roads to cost about $180,000, have been awarded by the County Commissioners of Wood County, O.

Columbiana County, Ohio, will construct about 45 miles of roads at an estimated cost of $600,000, during the present season.

The County Commissioners of Volusia County, Fla., have set June 8 as the date of an election on a bond issue of $400,000 for good roads.

The County Commissioners of Pierce County, Wash., have awarded a contract for resurfacing 12.54 miles of county roads to the Oregon Road Oiling Co.

The Board of Supervisors of Harris County, Tex., has decided to improve two sections of the Pulaski-Williamstown Highway at an estimated cost of $154,000.

Commissioner Farrel, head of the Public Works Division of Duluth, Minn., has announced a tentative paving program which involves the expenditure of $400,000.

Paving Aggregating 8.65 Miles and costing $367,017, was completed in Dallas, Tex., during the last fiscal year, according to the report of City Engineer J. M. Preston.

The State Highway Department of Kentucky has decided to complete the Central Valley-Highland Falls Road, work on which was discontinued some time ago, owing to lack of funds. About six miles remain to be completed.

The Rockland County Good Roads Association was formed at a recent meeting held at Nyack, N. Y., and the following officers were elected: President, A. S. Tompkins; Vice President, Frank E. Leaycraft; Secretary, George H. Wehram; Treasurer, Morris M. Whittaker.

The Board of County Commissioners of Tulsa County, Okla., have selected Harrington, Howard & Ash of Kansas City, Mo., to prepare plans for the new $200,000 bridge across the Arkansas River. The bonds for the bridge were voted at a recent election as noted in "Good Roads" for May 15.

The City Council of Corpus Christi, Tex., has decided to pave 68 blocks of the city streets. The specifications call for 12 kinds of pavement, as follows: Bitulithic with concrete foundation; asphalt macadam with crushed stone base; one-course concrete; bituminous coated one-course concrete; two-course reinforced concrete; asphaltic concrete; sheet asphalt; Uvalde rock asphalt; Westrumite asphalt; creosoted wood block; standard brick pavement, and vertical fiber brick.

COMING MEETINGS

June 1-3.—Conference of Mayors and Other City Officials of the State of New York.—Sixth Annual Meeting, Troy, N. Y. Secretary, William P. Capes, 105 East 22nd St., New York, N. Y.

June 7-9—National Conference on City Planning.—Conference, Detroit, Mich. Secretary, Flavel Shurtleff, 19 Congress Street, Boston, Mass.

June 22-25—Society for the Promotion of Engineering Education—Annual meeting. Iowa State College, Ames, Ia. Secretary, F. S. Bishop, University of Pittsburgh, Pittsburgh, Pa.

June 22-26—American Society for Testing Materials.—Annual meeting, Atlantic City, N. J. Secretary, Edgar Marburg, University of Pennsylvania, Philadelphia, Pa.

June 25-July 1.—The County Councils Association (Great Britain).—National Road Conference and Exhibition, London, England. Organizing Secretary, G. Montagu Harris, Secretary of the County Councils Association; Business Manager, A. F. May, 13 Victoria Street, Westminster, S. W., London, England.

August 4-5—Texas Good Roads Assocition and County Judges' and Commissioners' Association—Mid-Summer Meeting, Agricultural and Mechanical College of Texas, College Station, Tex. Secy., Texas Good Roads Association, D. E. Colp, San Antonio.

September 13-17—American Road Builders' Association and American Highway Association.—Pan American Road Congress, Oakland, Cal. Secretary, American Road Builders' Association, E. L. Powers, 150 Nassau St., New York, N. Y. Executive Secretary, American Highway Association, I. S. Pennybacker, Colorado Bldg, Washington, D. C.

October 11-15—National Paving Brick Manufacturers' Association—Annual convention, Dayton, O. Secretary, Will P. Blair, B. of L. E. Bldg., Cleveland, O.

October 11-15—American Society of Municipal Improvements—Annual convention. Dayton, O. Secretary, Charles Carroll Brown, 702 Wulsin Building, Indianapolis, Ind.

November 17-19—National Municipal League—Annual convention. Dayton, O. Secretary, Clinton Rogers Woodruff, 705 North American Building, Philadelphia, Pa.

Seventh National Conference on City Planning

The Seventh National Conference on City Planning, which will be held at the Hotel Statler, Detroit, Mich., June 7, 8 and 9, will comprise six sessions, the first of which will be held at 8 p. m. on Monday, June 7. The program for this session includes an address by Nelson P. Lewis, Chief Engineer of the Board of Estimate and Apportionment of New York City, who is the Vice President of the conference; a report entitled "Six Years of City Planning in the United States" by Flavel Shurtleff, Secretary of the conference; and a paper entitled "The City Plan of Detroit" by Edward H. Bennett, Consultant to the City Plan Commission of Detroit.

The second and third sessions, at 10 a. m. and at 2.30 p. m. on Tuesday, June 8, will be devoted to the subject of land subdivision and to the reports of local committees. The fourth session, at 8 p. m. on Tuesday, June 8, will be devoted to the subject of city planning and civic design, and the fifth and sixth sessions, at 10 a. m. and at 2.30 p. m. on Wednesday, June 9, will be devoted to the consideration of the topics, "Constitution and Powers of a City Planning Authority" and "European Planning Administration." The report of the committee which has been studying the first topic will be presented by Dr. Robert H. Whitten, Secretary of the City Planning Committee of the Board of Estimate and Apportionment of New York City, and the discussion of the second topic will be opened by Frank B. Williams, of New York, N. Y.

In addition to the sessions, there will be an automobile run to Belle Isle, with luncheon at the Casino, Monday noon; a business session at 4.30 p. m. on Wednesday, June 9, and a banquet at 7.30 p. m. the same day.

American Society for Testing Materials

Several reports and papers on matters of interest to road builders will be presented at the eighteenth annual meeting of the American Society for Testing Materials at Atlantic City, N. J., June 22-26. Business sessions will be held at 11 a. m., 3 p. m. and 8 p. m. on Tuesday, June 22; at 10 a. m. and 8 p. m. on Wednesday, June 23, Thursday, June 24, and Friday, June 25, and at 10 a. m. on Saturday, June 26. The seventh session, at 3 p. m. on Thursday, June 24, will be devoted to cement and concrete; the eighth session, at 10 a. m., Friday, June 25, to ceramics, gypsum and lime, and the tenth session, at 10 a. m. on Saturday, June 26, to road materials, timber and rubber.

Among the reports and papers on cement and concrete are the following: Report of Committee C-1 on Standard Specifications for Cement—G. F. Swain, Chairman; Report of Committee C-9 on Standard Tests of Concrete and Concrete Aggregates—S. E. Thompson, Chairman; "Microstructure of Concretes," by N. C. Johnson; "The Effect of Finer Grinding and a Higher SO_3 Content Upon the Physical Properties of Portland Cement," by P. H. Bates; "Some Abrasive Tests on Portland Cement Mortars to Select Aggregates and Mixes for Concrete Highways," by H. S. Mattimore; "Method of Weight-Volumetric Proportioning of Concrete Aggregates in Testing," by J. A. Kitts.

Included in the reports and papers on ceramics, gypsum and lime are the following: Report of Committee C-3 on Standard Specifications for Brick—A. V. Bleininger, Chairman; Report of Committee C-4 on Standard Specifications and Tests for Clay and Cement Sewer Pipes—Rudolph Hering, Chairman; Report of Committee C-6 on Standard Tests and Specifications for Drain Tile—A. Marston, Chairman; "The Legal Interpretation of the Word 'Vitrified' as Applied to Ceramic Products," by Edward Orton, Jr.; Report of Committee C-7 on Standard Specifications for Lime—J. S. Macgregor, Chairman.

The reports on road materials and timber are as follows: Report of Committee D-4 on Standard Tests for Road Materials—L. W. Page, Chairman; "Some Experiments on Technical Bitumens," by S. R. Church and J. M. Weiss; Report of Committee D-7 on Standard Specifications for Timber—H. Von Schrenk, Chairman; "A Fungus Bed Test of Wood Preservatives," by Cloyd M Chapman.

The Board of Aldermen of Woonsocket, R. I., has appropriated $126,100 for street and bridge work.

Hemphill County, Tex., has voted to issue $74,000 bonds to build a bridge across the Canadian River at Canadian, Tex.

The Voters of Greenville, S. C., have decided in favor of a bond issue and the city will proceed with street work aggregating over $225,000.

Granite Macadam is Used in Christiania, Norway, on approximately 75 per cent. of the streets. The remaining portion is paved with granite or wood blocks.

The Committee on County Roads of the Board of Supervisors of Oneida County, N. Y., has recommended the improvement of 32 pieces of county highway, aggregating 47 miles, at a cost of approximately $100,000. The work will be done during the present season.

PERSONAL NOTES

C. D. Farmer has been elected Street Commissioner of Eugene, Ore.

W. G. Tandy has been elected Commissioner of Streets of Topeka, Kan.

C. C. Bonebrake has been reappointed City Engineer of Santa Ana, Cal.

Ross A. Frederick has been appointed City Engineer of Sault Ste. Marie, Mich.

G. L. Gregory has been appointed Superintendent of Streets of San Bernardino, Cal.

Frederick A. Caldwell has resigned as Assistant City Engineer of Providence, R. I.

H. Moseley has been appointed City Engineer of Dallas, Tex., vice J. M. Preston, resigned.

C. W. Anderson has been appointed City Engineer of Centralia, Wash., to succeed Stanley Macomber, whose resignation was noted in "Good Roads" for March 6.

William S. Moore, former City Engineer of South Bend, Ind., has been appointed City Engineer of Grand Rapids, Mich.

J. M. Preston, for seven years City Engineer of Dallas, Tex., has resigned to resume private practice with offices at Dallas.

Howard W. Holmes, former Chief of the Bureau of Highways and Bridges of Portland, Ore., has been appointed Assistant State Highway Engineer of Oregon.

J. F. Stukenborg, County Superintendent of Roads of Montgomery County, Ala., has resigned. County Engineer T. H. Edwards has assumed charge of all road work.

J. E. Maloney, Secretary-Engineer of the Colorado Highway Commission, addressed a recent meeting of the Colorado Association of Members of the American Society of Civil Engineering at Denver, Col. His subject was "Colorado State Highways."

S. D. Clinton, Assoc. M. Am. Soc. C. E., recently Division Engineer of the Idaho State Highway Commission, has been appointed Assistant Field Engineer of the Interstate Commerce Commission, Division of Valuation, Fifth Division, with headquarters at San Francisco, Cal.

NEWS OF THE TRADE

The West Jersey Sand & Gravel Co., of Camden, N. J., has been incorporated under the laws of New Jersey with a capital of $100,000. The incorporators are Michael J. McEnery, Rodney Morrison, Jr., and Roy A. Mammaring, all of Camden.

The Van Hafften Construction Co., of St. Joseph, Mo., has been incorporated under the laws of Missouri with a capital of $10,000. The company will engage in highway and other contracting work.

The Standard Construction Co., of Davenport, Ia., has been incorporated under the laws of Iowa, with an authorized capital of $10,000. The company will carry on a general contracting business, including road work.

The Holt Manufacturing Co., Inc., Stockton, Cal., has issued a 32-page and cover booklet descriptive of the Holt 45-HP. caterpillar tractor. The booklet is attractively bound in buff paper, printed in red and green and is profusely illustrated with fine half-tone reproductions of photographs showing various parts of the tractor and the variety of uses to which it is adapted.

"Simple Forms for Concrete" is the title of a 24-page booklet issued by the Vulcanite Portland Cement Co., New York and Philadelphia. It is illustrated with diagrams of forms for concrete walls, columns and other structures.

Officers of the Cement Products Exhibition Co. were elected at the annual meeting of the company on May 11 as follows: President, B. F. Affleck; Vice President, A. Y. Gowen; Secretary, Robert F. Hall, and Treasurer, J. U. C. McDaniel.

The Link-Belt Co., Chicago, Ill., has recently issued Catalogue No. 210, descriptive of the Link-Belt portable wagon loader. The catalogue contains 48 pages and is printed on fine paper with a three-color cover. It contains descriptive matter and many excellent half-tone illustrations.

The Galion Iron Works & Manufacturing Co., Galion, O., has issued an attractive folder descriptive of its line of road machinery. The folder is 5¼x6¼ ins., and is printed in red, blue and black. In addition to descriptive matter, it contains several illustrations in color and numerous halftones.

NEWS NOTES

The Province of Alberta, Canada, has appropriated $750,000 for road construction and maintenance during 1915.

The City Commissioners of Chattanooga, Tenn., have been asked to authorize a bond issue of $100,000 for the purpose of paving Market St.

The Province of Quebec, Canada, has voted an additional $5,000,000, making $25,000,000 in all, to carry out the road program formulated in 1912.

The Duluth, Minn., City Council has awarded paving contracts to the S. R. Okes Construction Co. for $52,897.01 and to A. N. Nelson for $17,793.20.

The City Council of Lawrence, Mass., has voted a $300,000 Central Bridge bond issue. The bonds will run for 30 years and will bear interest at the rate of 4 per cent.

A Good Roads and Farmers' Day Celebration will be held at Livingston, Tex., on June 8, for the purpose of organizing a movement for a highway between Houston and Lufkin, Tex.

The County Commissioners of Wyandotte County, Mo., have approved plans for the rebuilding of the Central Avenue bridge across the Kaw River at Kansas City, Mo., at a cost of approximately $500,000.

The City of Wilmington, Del., has sold $300,000 bonds to Harris, Forbes & Co., of New York, N. Y. The proceeds will be used for the improvements of streets as the first move in the $500,000 paving project noted in "Good Roads" for April 24.

The Central Florida Highway Association was formed recently at Kissimmee, Fla. Nine counties were represented at the meeting, including Hillsborough, Polk, DeSoto, Osceola, Orange, Seminole, Volusia, Dade and Putnam. It is proposed to organize the association on a permanent basis at a meeting to be held at Orlando, Fla., on June 10.

The California Legislature has passed appropriation bills carrying two items of $50,000 each for the construction of a state highway through the Pacheco Pass, connecting the Santa Clara County highway with the highway in Madera County and for the construction of a highway through Cholame Pass from Bakersfield to the San Luis Obispo County Highway.

The Bexar County Highway League will inaugurate an active campaign for good roads in South Texas about June 1. Secretary D. E. Colp will be in charge of a corps of lecturers who will make a trip in a special car which will be fitted up for demonstration work in road building. Stops will be made at all county seats between San Antonio and Laredo, in the lower valley of the Rio Grande and in the Gulf Coast region.

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Notice to discontinue subscription should be sent to the New York office.

Copy for advertisements of which proofs are to be submitted to advertisers should reach the New York office as follows: For insertion in the first issue of the month, by the fifteenth of the preceding month; for other issues, by noon on Thursday of the week before date of issue.

Copy for all advertisements of which proofs need not be submitted—including "Proposal," "For Sale," "Want" and other classified advertisements—will be accepted until noon on Thursday of the week of issue.

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Governor Rye of Tennessee Signs Bill Creating a Highway Department

Governor Rye of Tennessee has approved an act passed by the present Legislature creating a State Highway Department, which shall be under the control of a State Highway Commission to be appointed by the Governor.

The commission, according to the provisions of the act, shall consist of the Governor, the State Geologist, the Dean of Engineering of the University of Tennessee and three members, each representing a grand division of the state. The commission is empowered to elect its own officers, including a secretary, who shall not be a commissioner.

One of the first acts required of the commission is the planning of a system of highways connecting all county seats. A portion of the state motor vehicle tax is set aside for the maintenance of the commission.

"Good Roads Days" in West Virginia

May 20 and 21 were observed as "Good Roads Days" in West Virginia, in accordance with the proclamation of Governor Hatfield, noted in "Good Roads" for May 8.

In several sections of the state, rain interfered with a complete observance of the first day, but there was, nevertheless, a satisfactory response to the call for volunteer road workers.

It was estimated that about 27,000 men worked on the roads the first day and almost as many the second day. Many who were debarred by physical or other reasons from taking an active part in the work contributed money, and various women's organizations throughout the state served meals to the workers.

Governor Whitman of New York Vetoes the Albany Post Road Bill

Governor Whitman of New York has recently vetoed a measure known as the Slater Bill, which would have made possible the construction of electric railways on the Albany Post Road.

By this action the Burns law remains on the statutes, and the road cannot be used for traction lines. For several years this law has been the object of attack by traction interests, who have been strongly opposed by residents along the Albany Post Road and by others interested in the highway.

A Report on Good Roads Week at Cornell University

A full report of the proceedings of the first "Good Roads Week," held under the auspices of the College of Civil Engineering of Cornell University at Ithaca, N. Y., February 15-20, 1915, is given in the March-April number of "The Cornell Civil Engineer," a monthly periodical published by the Association of Civil Engineers of Cornell University. Four hundred and seventy-four pages of this issue, which takes the place of the regular March and April issues, are devoted to the "Good Roads Week."

The contents include a brief summary of the proceedings, the addresses of welcome, the full text of the papers presented and reports of discussions. Among the technical papers printed are the following: "Surveys and Plans for Road Work," by Mark W. Nelson, of the New York State Highway Department; "Road Drainage," by M. J. Adams, of the New York State Highway Department; "Town Roads," by Walter F. Willson, formerly Third Deputy Commissioner of the New York State Highway Department; "Road Materials Available in New York State and Their Adaptability for Different Types of Construction," by H. S. Mattimore, in Charge of Physical Testing of Materials, New York State Highway Department; "Highway Culverts and Bridges," by O. L. Grover, Chief Bridge Engineer, U. S. Office of Public Roads; "Public Borrowing for Road Building," by Prof. A. A. Young, Department of Economics, Cornell University; "Gravel Roads," "Road Economics" and "Sand-Clay Roads," by Dr. L. I. Hewes, U. S. Office of Public Roads; "Surface Treatments and Bituminous Construction," by Howard E. Smith, Division Engineer, New York State Highway Department; "The Mining and Refining of Lake Asphalts and the Physical and Chemical Characteristics of Asphalts for Paving Purposes," by J. S. Miller, of the Barber Asphalt Paving Co.; "Asphalt Block Pavement," by George P. Hemstreet, Superintendent, Hastings Pavement Co.; "Cost and Economy of Cement Concrete Pavements" and "Standard Recommended Practices for Construction of Concrete Roads," by H. E. Hilts, Road Engineer, Association of American Portland Cement Manufacturers; "Organization of a Highway Department," by George A. Ricker, formerly First Deputy Commissioner of the New York State Highway Department; "Masonry and Foundations," by Prof. H. S. Jacoby, College of Civil Engineering, Cornell University;

"Inspection of Highway Bridges," by Prof. C. L. Crandall, College of Civil Engineering, Cornell University; "Manufacture and Inspection of Paving Brick" and "Construction of Brick Pavements," by Will P. Blair, Secretary, National Paving Brick Manufacturers' Association; "Proper Construction of Brick Pavements," by Wm. C. Perkins, Chief Engineer, Dunn Wire-Cut-Lug Brick Co.; "Cost Keeping and Management," by Prof. Fred Asa Barnes, Assistant Professor of Railroad Engineering, Cornell University; "Prospecting for Road Material," by Prof. Heinrich Ries, Geology Department, Cornell University.

Work of the Montana State Highway Commission During 1914

According to a report prepared by George R. Metlen, Secretary of the Montana State Highway Commission, the state spent $2,553,772.51 for road and bridge work up to December 1, 1914, as against $1,810,533.55 in 1913 and $1,532,787.80 in 1912.

The following figures show in detail the financial operations of the Commission during 1914:

Fund	Paid out to Dec. 1	Bal. on hand Dec. 1	Warrants out Dec. 1
General Road.........	$1,716,646.54	$950,446.78	$1,205,877.99
General Bridge........	732,725.81	521,648.56	434,489.70
Special Road & Bridge	104,400.16	46,924.66	....
Totals...............	$2,553,772.51	$1,519,020.00	$1,640,366.99

Highway Expenditures in Milwaukee County, Wisconsin

The third annual report of the County Highway Commissioner of Milwaukee County, Wis., shows expenditures of $625,277.08 for road and bridge work during 1914, out of available funds amounting to $733,785.57.

The following table, covering the four years from 1912 to 1915 inclusive, shows the amount of state aid received by Milwaukee County, together with the county appropriations and the total expenditures. It will be noted that there is a balance of $740,445.15 available for 1915 work:

Year	State aid	County Appro.	Total	Expended
1912.........	$72,248.16	$153,800	$226,048.16	$121,640.67
1913.........	74,455.81	158,195	232,650.81	410,570.40
1914.........	241,235.57	492,750	733,985.57	625,277.08
1915.........	248,750.00	498,500	747,250.00	*42,001.24
Totals....	$636,689.54	$1,303,245	$1,939,934.54	$1,199,489.39

*Outstanding Jan. 1, 1915.

Colonization Roads in the Province of Ontario, Canada

In a report to the Department of Commerce, Consul J. D. Dreher, at Toronto, Ont., states that, in continuation of its policy of opening up new districts for settlement, the Province of Ontario spend $480,845 for colonization roads during 1914, and that during June and July between 4,500 and 5,000 men were employed in the construction and improvement of roads.

The province now has more than 12,000 miles of what may be called colonization roads and an official report states that the roads are now in such condition that the settler can reach a market at all times during the year. On most of the main trunk roads it is now possible to travel by automobile and the farmer living 15 or 20 miles from a market town can market his produce and return the same day.

Highway Work in the State of Washington

The State Highway Department of Washington will open bids on June 2 for a portion of the work included in the program for 1915. As stated in "Good Roads" for May 15, the state program contemplates the expenditure of $1,057,738 during the present season and $870,440 during 1916.

The work covered by the bids to be opened on June 2 includes the Nisqually section of the Pacific Highway, the cost of which is estimated at between $30,000 and $35,000; another section of the same highway covering six miles in Lewis County, at an estimated cost of $25,000, and a mile of new approach to the Mashel River bridge on the National Park Highway, the cost of which is estimated at $20,000.

This bridge will be of concrete, 190 ft. in length and, with the approach, will replace the present 521-ft. wooden bridge and eliminate two dangerous curves.

NEWS NOTES

The City of Davenport, Ia., is using white paving bricks to mark the safety zones on some of the streets, instead of the usual painted lines.

The Authorities of Pittsburgh, Pa., are considering an ordinance authorizing a $240,000 bond issue for the purpose of raising the Penn Avenue district above the flood level.

The Sinking Fund Commission of Cleveland, O., has purchased $300,000 worth of bonds for the Clark Ave. high level bridge. This issue is a part of $950,000 authorized at a referendum election a year ago.

The Authorities of Brazoria County, Texas, have awarded a contract for construction of about 30 miles of shell and gravel roads to W. D. Haden, of Galveston, Tex. The contract involves the expenditure of more than $100,000.

The State of Colorado observed May 14 as "Good Roads Day." Citizens throughout the state did a great deal of useful road work, encouraged by the example of Governor Carlson, who worked on the Bergen Park roads near Denver.

Governor Whitman of New York has approved the appropriation of $50,000 as the state's share of the cost of the Minetto bridge at Oswego, N. Y. Of the balance, Oswego County and the towns of Oswego and Volney will pay $23,000 each.

Lake County, Florida, has awarded contracts for about 128 miles of sand-clay roads to the Edwards Construction Co., of Tampa, Fla., and the Owens Construction Co., of Vicksburg, Miss. The county is to spend $500,000 for road building.

A Special Election Will be Held in Detroit, Mich., during the last week of June or the first week of July, on the question of a bond issue for a new Belle Isle bridge to replace the structure which was burned, as noted in "Good Roads" for May 8.

The Contractors' Association of Philadelphia was recently organized on the lines of the New York association. The following officers were elected: President, David Peoples; Secretary, R. A. Mannwaring; Treasurer, H. W. Underwood. The headquarters of the association are at 538 Commercial Trust Building, Philadelphia, Pa.

The Authorities of Columbia County, Florida, are considering the advisability of calling a special election on a bond issue of $325,000. The plans contemplate the construction of brick roads east and west from the Suwannee-Columbia county line to the Columbia-Baker county line and north and south from the Hamilton-Columbia county line to Lake City.

District Attorney Evans of Multnomah County, Oregon, has decided that the Board of County Commissioners cannot legally require a 10-year guarantee for the maintenance of roads to be constructed under the recently voted bond issue for $1,250,000. The proceeds of the bonds, according to Mr. Evans, must be used for the construction of roads and cannot be applied to maintenance.

Two Hundred Thousand Barrels of Cement will be used for public improvements in the State of Washington during the next 20 months. This is said to be the largest single order for cement ever offered in the Northwest. The quantity will be ordered in a lump and divided as follows: Seattle, 30,000 barrels; Tacoma, 20,000; Pierce County, 24,000; King County, 81,000; Seattle Port District, 30,000; Inter-County River Improvement District, 15,000.

COMING MEETINGS

June 1-3.—Conference of Mayors and Other City Officials of the State of New York.—Sixth Annual Meeting, Troy, N. Y. Secretary, William P. Capes, 105 East 22nd St., New York, N. Y.

June 2-3.—Massachusetts Highway Association.—Spring Meeting, Springfield, Mass. Secretary, J. M. McCarthy, Boston.

June 3-4.—Good Roads and Drainage Congress.—Houston, Tex.

June 7-8.—Ozark Trails Association.—Annual Convention, Independence, Kan.

June 7-9—National Conference on City Planning.—Conference, Detroit, Mich. Secretary, Flavel Shurtleff, 19 Congress Street, Boston, Mass.

June 22-25—Society for the Promotion of Engineering Education—Annual meeting. Iowa State College, Ames, Ia. Secretary, F. S. Bishop, University of Pittsburgh, Pittsburgh, Pa.

June 22-26—American Society for Testing Materials.—Annual meeting, Atlantic City, N. J. Secretary, Edgar Marburg; University of Pennsylvania, Philadelphia, Pa.

June 25-July 1.—The County Councils Association (Great Britain).—National Road Conference and Exhibition, London, England. Organizing Secretary, G. Montagu Harris, Secretary of the County Councils Association; Business Manager, A. F. May, 13 Victoria Street, Westminster, S. W., London, England.

August 4-5—Texas Good Roads Assocition and County Judges' and Commissioners' Association—Mid-Summer Meeting, Agricultural and Mechanical College of Texas, College Station, Tex. Secy., Texas Good Roads Association, D. E. Colp, San Antonio.

Sept. 13.—Tri-State Roads Association.—Third annual convention, San Francisco, Cal. Executive Secy., Geo. E. Boos, 1220 Flood Bldg., San Francisco, Cal. (Meeting to be merged with the Pan-American Road Congress.)

September 13-17—American Road Builders' Association and American Highway Association.—Pan American Road Congress, Oakland, Cal. Secretary, American Road Builders' Association, E. L. Powers, 150 Nassau St., New York, N. Y. Executive Secretary, American Highway Association, I. S. Pennybacker, Colorado Bldg, Washington, D. C.

October 11-15—National Paving Brick Manufacturers' Association—Annual convention, Dayton, O. Secretary, Will P. Blair, B. of L. E. Bldg., Cleveland, O.

October 11-15—American Society of Municipal Improvements—Annual convention. Dayton, O. Secretary, Charles Carroll Brown, 702 Wulsin Building, Indianapolis, Ind.

November 17-19—National Municipal League—Annual convention. Dayton, O. Secretary, Clinton Rogers Woodruff, 705 North American Building, Philadelphia, Pa.

Plans for the Pan-American Road Congress

The Executive Committee of the Pan-American Road Congress has been advised by the officials of the Tri-State Good Roads Association that they have decided to cooperate with the officials of the Pan-American Road Congress by changing the date of the Pacific Coast Good Roads Congress from the week of August 2 to that of September 13. This means the practical merging of the meeting of the Tri-State Association with the Pan-American Road Congress.

A meeting of the Executive Committee was held in New York on Saturday of last week, at which the various subcommittees reported progress and further plans were made for the holding of the congress at Oakland next September. While all topics have not yet been assigned to speakers, the following subjects have been decided upon: The History and Future of Highway Improvement; The Benefits and Burdens of Better Roads; The Relation of the Road to Rail and Water Transportation; The Responsibility for Road Conditions and the Way to Secure the Improvement of Road Conditions; Tree Planting and Roadside Aesthetics; The Essentials of Proper Laws for Highway Work; Highway Indebtedness—Its Limitation and Regulation; Organization and System in Highway Work; The Educational Field for Highway Departments; System in Highway Accounting; Uniformity for Highway Statistics and Data; Engineering Supervision for Highway Work; The Merit System in Highway Work; The Determination of the Justifiable Outlay for Specific Cases of Proposed Highway Improvement; Proper Road Location—Its Importance and Effects; Road Drainage and Foundations; Highway Bridges and Structures; Roadway Surfacings; Resurfacing Old Roads; Street Pavements; Convict Labor for Highway Work; Equipment for Highway Work; Motor Traffic—Its Developments, Trend and Effects; Load and Tire Effect and Regulation; Comparisons of Traffic and Their Economic Value; Maintenance, Materials and Methods; Dust Suppression and Street Cleaning.

Massachusetts Highway Association

The annual spring meeting of the Massachusetts Highway Association, which will be held at Springfield, Mass., on Wednesday and Thursday, June 2 and 3, will be participated in by the Association of Connecticut Road Officials and the Mayors' Club of Massachusetts.

The program for the meeting includes a banquet at the Hotel Kimball on Wednesday evening, June 2, and automobile tours on Thursday, June 3. The forenoon trip will provide an opportunity to see different kinds of pavement and will include visits to the City Yard and the Municipal Asphalt Plant. In the afternoon a tour will be made to different paving jobs under construction.

Pacific Coast Good Roads Congress

The date of the annual convention of the Tri-State Good Roads Association, known as the Pacific Coast Good Roads Congress, to be held at San Francisco, Cal., has been changed from August 2 to September 13, as is noted elsewhere on this page.

This action has been taken in order to hold the meeting at the same time as the Pan-American Road Congress, with which the meetings of the Tri-State Good Roads Association will be merged. Further announcement of the details of the arrangements will be made later.

MEETINGS

American Automobile Association

The annual meeting of the American Automobile Association was held recently at Boston, Mass.

Among the subjects considered at the meeting that of federal aid in the construction of roads was given considerable attention. President John A. Wilson, in his annual address, stated the belief of the organization in the principle of federal aid, and one of the most important resolutions adopted was one referring to the same subject. This resolution, which was introduced by Chairman George C. Diehl of the Good Roads Board, pledged the A. A. A. "to support any measure introduced in the forthcoming Congress which shall present a logical plan for national cooperation with the several states, and which plan, in our opinion, should include the appropriation by Congress of an annual sum to be distributed among the several states on the basis of population, area and mileage; to be supplemented by a like amount of money from the states, and the total to be expended upon whatever main market and post roads the highway department of a state and the Secretary of Agriculture may decide."

Officers were reelected as follows: President, John A. Wilson; Secretary, John N. Brooks; Treasurer, H. A. Bonnell; Chairman of the Executive Board, A. G. Batchelder. Vice Presidents were elected as follows: First Vice President, Dr. H. M. Rowe, Maryland; Second Vice President, Ralph W. Smith, Colorado; Third Vice President, P. J. Walker, California; Fourth Vice President, H. J. Clark, Minnesota; Fifth Vice President, Preston Belvin, Virginia. Chairmen George C. Diehl, of the Good Roads Board, and Richard Kennerdell, of the Contest Board, were reappointed by President Wilson.

It was decided that the annual meeting in 1916 would be held in Washington, D. C.

Arizona Good Roads Association

The annual conference of the Arizona Good Roads Association was held at the Chamber of Commerce, Tucson, Ariz., May 15, and was attended by Governor Hunt and delegates from various sections of the state. Dwight B. Heard, of Phoenix, President of the Association, was chairman of the meeting.

The program included a discussion ot the best method of securing cooperation between counties by John Metz, of Tucson, and State Engineer Lamar Cobb, a discussion by county engineers of "Permanent and Temporary Work on Roads," and an illustrated lecture on "Types of Road Construction" by George D. Marshall, of the United States Department of Agriculture.

Boone Highway Association

A recent meeting of the commissioners on location and building of the Boone Highway Association was held at Crab Orchard, Ky., on May 14. The meeting was attended by about 500 delegates in addition to the 32 commissioners, and was devoted to the selection of the route of the so-called "Boone Highway."

The meeting was called to order by James Maret, President of the Association. The address of welcome was made by W. B. Hansford, of Crab Orchard, and the response by Emmett Puryear, of Danville. Edgar Albright, of Mt. Vernon, was elected chairman of the general meeting. The counties represented were Anderson, Bell, Boyle, Fayette, Franklin, Garrard, Jefferson, Jessamine, Knox, Lincoln, Mercer, Rockcastle, Shelby, Whitley and Woodford.

A committee, consisting of James Maret, President, ex-officio; N. L. Curry, of Mercer; K. S. Alcorn, of Lincoln; H. V. Bastin, of Garrard; J. M. Alverson, of Anderson, and R. M. Allen, of Fayette, was appointed to formulate plans for a permanent organization of the Association.

The route selected for the proposed highway begins at Cumberland Gap and passes through Middlesboro, Pineville, Barbourville, Corbin, London, Mt. Vernon, Crab Orchard, Stanford, Lancaster and Danville to Harrodsburg, where it branches. The eastern branch runs through Nicholasville, Lexington and Versailles to Frankfort, and the western branch through Lawrenceburg to Frankfort. From this point the route is over the old state pike to Shelbyville and Louisville.

The Fiscal Court of Nicholas County Ky., has ordered a reissue of $125,000 road bonds at 5 per cent., there being no demand for the former issue of 4½s.

The Board of County Commissioners of Montgomery County, Ohio, has authorized the paving with brick of Main Market Road No 7, throughout its entire length of approximately 20 miles.

PERSONAL NOTES

T. D. Kilkenny has been appointed City Engineer of Vallejo, Cal.

S. B. Weir has been appointed County Engineer of Taylor County, Ia.

W. A. Graham has been elected Street Commissioner of Fremont, Neb.

E. F. Peterson has been appointed City Engineer of Muskogee, Okla., to succeed Harry White.

F. J. Anderson has been appointed City Engineer of South Bend, Ind., vice W. S. Moore, resigned.

Edward J. Houghton has been placed in charge of the Department of Streets and Public Improvements of New Brunswick, N. J.

C. J. Donaldson has been appointed County Surveyor of Mountrail County, N. D., with headquarters at Stanley, N. D.

John W. Budd, former Assistant Engineer of Des Moines, Ia., has been appointed County Engineer of Polk County, Ia.

E. D. Treadwell has been appointed Acting City Engineer of Webster Groves, Mo., filling the vacancy occasioned by the resignation of R. L. Mook.

Henry A. Varney has been appointed Town Engineer of Brookline, Mass., succeeding the late A. H. French, M. Am. Soc. C. E., whose death was noted in "Good Roads" for May 15.

D. S. Hooker, formerly Highway Engineer in the office of the State Engineer of New Mexico, has been appointed Civil Engineer of the Public Utilities Commission of Colorado.

J. W. Mavity, of Lyndon, Kan., has been appointed City Engineer of Wellington, Kan., where he will have entire charge of the large amount of paving to be undertaken at an early date.

A. R. Knight has resigned as Sales Manager of the Mexican Petroleum Co., New Orleans, La., and has accepted a position as Manager of the Asphalt and Road Oil Department of the Gulf Refining Co., Pittsburgh, Pa.

NEWS OF THE TRADE

A folder recently issued by the Hydrex Felt & Engineering Co., New York, N. Y., deals with the Hydrex expansion joint cushion strip for concrete, brick, wood block and granite block pavements.

The Sullivan Machinery Co., Chicago, Ill., has issued Booklet No. 115, descriptive of the Sullivan air compressors. It contains 32 pages of descriptive matter and halftone illustrations and is bound in blue paper.

The United States Cast Iron Pipe & Foundry Co. will open a new office at 1404 R. A. Long Building, Kansas City, Mo., about June 1. R. C. Clifford, formerly of the St. Louis, Mo., office, will be in charge.

The Longacre Construction Co., of New York City, has been incorporated under the laws of New York, with a capital of $10,000. The incorporators are E. Moesch, J. A. Graves and J. A. Fechtig, all of New York City. The company will do general contracting work, including road building.

The Authorities of Allegheny County, Pennsylvania, have authorized the improvement of nine county roads aggregating nearly 20 miles at an estimated cost of $446,602.

The Commissioner of Public Works of Buffalo, N. Y., has awarded contracts to the German Rock Asphalt & Cement Co. for street improvements aggregating $86,710.

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Copy for all advertisements of which proofs need not be submitted—including "Proposal," "For Sale," "Want" and other classified advertisements—will be accepted until noon on Thursday of the week of issue.

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HIGHWAY LOCATION

How little advance has been made in the methods of locating public roads in some parts of this country is indicated in an extract from a recent technical paper which is printed elsewhere in this issue. Fortunately, the conditions described by Mr. Fawcett do not obtain everywhere. At the same time, their prevalence is general enough to constitute a serious handicap to the building of better roads.

At present the greatest expenditures are made in the improvement of existing roads, not in constructing new ones. These betterments frequently involve relocation that may in some cases amount to making entirely new locations of considerable length. In such cases the location work is generally done by competent engineers who perform their tasks in a thorough and scientific manner. New work, however, that is the laying out of new roads, is largely done by small units, the towns, road districts, sparsely settled counties, and so on. As a general thing these units are too small to have engineering departments, and the highway officials do not realize the desirability of employing an engineer especially for the work. In such cases the aid of a state department which renders engineering services to the local units might well be invoked but not in all cases is such assistance available nor do the local authorities always take advantage of such help when it is proffered.

A new road is ordinarily opened to take care of a comparatively small amount of travel. Were this amount not likely to increase, the proper location of the road would be of not much importance. But in the usual course of events the volume of traffic will increase—in some circumstances may increase very rapidly. As soon as the increase is great enough there will arise a demand for the improvement of the road, and the authorities will make improvements more or less commensurate with the service that is desired of the road. Further betterments will follow succeeding increases in traffic and in time the road may be included in a system of main roads, perhaps in a state-wide system of trunk lines.

When this time comes the highway authorities of the county, the state or whatever unit has the road under its jurisdiction, are confronted with the task of making such improvements as are necessary to make a first-class highway out of what was originally a country road. The improved main road must accommodate a heavy mixed traffic which will include automobiles traveling at high rates of speed; the original road was built for a few slowly moving teams. Unless the road was better located than are the majority of country roads, it will be necessary to relocate it in order to secure an alignment and grades suitable to modern traffic conditions. If the road is situated in a hilly country, the loss resulting from the improper location in the first place will be particularly large, especially if very much grading was done in the construction of the original road. Grading and drainage work is largely permanent work, and should be done in the first instance in such a manner that it will not need to be done over. This is, of course, possible only when the road is properly located, in the first place, so that relocation, beyond widening the road at curves, or other slight changes, does not become necessary.

It costs little more to locate a road properly than to lay it out along the line of least resistance, and no matter how unimportant a proposed road may seem it will be generally found cheaper in the end to expend the sum necessary to secure the services of a competent engineer to do the location work.

EXCESSIVE ZEAL IN ALABAMA

At the recent session of the Legislature of Alabama as was noted in a recent issue of "Good Roads," the Senate passed a law requiring the teaching of "civil engineering and practical and scientific road building" in various educational institutions in the state. These institutions are "the several county high schools" and "the several normal schools," as well as "the several agricultural schools," the University of Alabama and the Alabama Polytechnic Institute. The term of instruction is to be six weeks in each year in the high, normal and agricultural schools, at least six weeks at the State University and the Polytechnic Institute, and six weeks in the summer schools of the two last named institutions. The House did not take action on the bill and it is held for the reassembling of the Legislature next month.

This measure—which we understand will probably be passed—merits the attention of road builders.

The matter of undergraduate courses in highway engineering was discussed briefly in the issue of November 7, 1914, under the caption "The Supply of Highway Engineers." As pointed out at that time, the four years' preparation in the engineering school is not long enough to permit the training of specialists in any branch of engineering. It is so short compared with the amount of work that has to be done that every hour must be utilized to the best possible advantage if the school is to fulfill its function, which is, to quote our previous statement, "to give the young man such training in the science of engineering as will enable him to rapidly acquire, after graduation, the art of that particular branch of the profession with which he becomes identified." Similar conditions as to crowding many subjects into a comparatively short time also exist in other educational institutions.

If the high schools and preparatory schools are regarded as schools whose function it is to prepare students for college and technical school courses, it is certain that the time in them could be used to better advantage in giving the students the instruction which will provide the groundwork for their later education. On the other hand, if the high school course is to be the end of the young man's scholastic education, a course in "civil engineering and practical and scientific road building" would seem to be about the last thing that he needed. Not one man in several thousand devotes his time to building roads, and as a preparation for the ordinary duties of life there are innumerable subjects which he might pursue to better advantage.

The most that the average man needs to know about road building is that it is an art which requires a considerable amount of special knowledge and that it should be intrusted only to those who have this special knowledge. If the public could be made to realize this and to leave road building to road builders, it would mark the greatest step forward that has ever been taken in the work of highway betterment.

In addition to the objections noted above, there is the absurd wording of the statute, which provides for the teaching of a course in "civil engineering and practical and scientific road building." Civil engineering comprises a variety of sciences and arts, including the building of roads, and, assuming that the prime object of the course is to give instruction in road building, it is clear that in a period of six weeks very little time would be left for instruction in the remaining branches of civil engineering. Again, why "practical and scientific" road building? The only explanation of the use of these two terms would seem to be that the statute is intended to be an embodiment of the popular idea that all engineering work is divided into two kinds—the one comprising that work done by those whose only training has been in practice and the other by those who have had the advantages of both education and practice or who have only the knowledge of the underlying principles of the art. This idea is probably too deeply rooted in human nature to ever be eradicated, so that it is probably useless to affirm that the more scientific the work the more practical it will be.

Lastly, what sort of a training for the work of building roads do the Alabama legislators expect to be given in a period of six weeks? There is an old saying to the effect that a small amount of knowledge is a dangerous possession. It is difficult to see any effect of the proposed plan except to give to a few citizens just enough knowledge of road building so that they will be ready and willing to hinder the efforts of those trained road builders who may have in charge the building of the roads under their observation.

With thousands of little children working long hours in its mills, Alabama could well employ its legislators' time in devising educational measures that would be more beneficial than the establishment of six-week courses in "civil engineering and practical and scientific road building."

REPORT OF THE A. R. B. A. STANDARDS COMMITTEE

Elsewhere in this issue considerable space is given to the report of the Committee on Standards of the American Road Builders' Association. This report, although somewhat voluminous, is in the nature of a progress report, having been submitted as such by the committee at the annual meeting of the A. R. B. A., held in New York on February 5. It has not heretofore been made public, but will be printed in the annual "Proceedings" of that organization, which is now in the hands of the printer. It will be taken up at the next convention of the A. R. B. A. for action by the association.

The committee—wisely, we believe—has avoided any attempt to draw up so-called standard specifications. This work, as pointed out in the report, is already being done by several organizations, and it would seem that no good purpose would be served by bringing before the road builders of the country another set of specifications which would necessarily be almost identical with those which have already been drawn.

It is felt that certain portions of the report will be found of especial value. One such part is that describing field tests of road building materials. These are well arranged and provide for simple processes which can readily be applied under the conditions existing in almost any field work and by those who have had no experience in the performing of the more elaborate work of testing such as is done in laboratories. Another part of the report that deserves special mention is the section devoted to instructions for inspectors or foremen engaged in maintenance and repair work. The suggestions made are practical and can be readily understood, even by those who are entirely lacking in engineering training or experience.

Weight is added to the report by the personnel of the committee which drew it. The chairman is one of the best known engineers of the country and all of the other members are men who are very well known throughout road building circles.

The Voters of Portland, Oregon, will vote on a proposed amendment to the Bancroft Bonding Act at the city election on June 7. The amendment, as drafted, provides for the collection of principal and interest from property owners in semi-annual installments, instead of annually as at present.

The Survey of the Idaho State Highway System

An account of the work of surveying the roads comprised in the state highway system of Idaho is given in the first biennial report of the State Highway Commission of that state for the period ending December 31, 1914.

The State Highway Commission was established in 1913 by a law which authorized the providing of a trunk line system to be built by contract under the supervision of the state. It was provided that the cost of construction should be borne jointly by the state and the counties through which the roads ran, the state paying one-third and the counties two-thirds, and that the roads should be maintained by the state. The first work undertaken by the commission was that of selecting the routes of the state highways. These are as follows:

The Idaho-Pacific Highway, commencing at the Idaho-Utah line near the southeastern corner of Idaho and extending northwesterly, then westerly, then again northwesterly through Montpelier, McCammon, Pocatello, American Falls, Burley, Twin Falls, Buhl, Hagerman, Bliss, Mountain Home, Boise, Nampa, Caldwell and New Plymouth to Payette, thence northerly near the western border of the state, through Weiser, Council, Pollock, Grangeville, Nez Perce, Lewiston and Moscow to the Idaho-Washington line, near Moscow, a total distance of about 800 miles. It is expected to extend this survey later to Sandpoint via Coeur d'Alene, an additional distance of about 150 miles.

The Idaho-Montana Highway, extending from a point on the Idaho-Montana line near Gibbonsville in Lemhi County and extending southeasterly through Gibbonsville, Salmon, Leadore, Gilmore and Roberts to Idaho Falls, thence southwesterly through Blackfoot to a connection with the Idaho-Pacific Highway at Pocatello, a total distance of about 200 miles.

The Idaho-Utah Highway, commencing at a point on the Idaho-Utah line in Franklin County, near the southeastern corner of the state, and extending in a general northerly direction through Preston, Dayton and Downey to a connection with the Idaho-Pacific Highway, 2 miles south of McCammon, a total distance of about 57 miles.

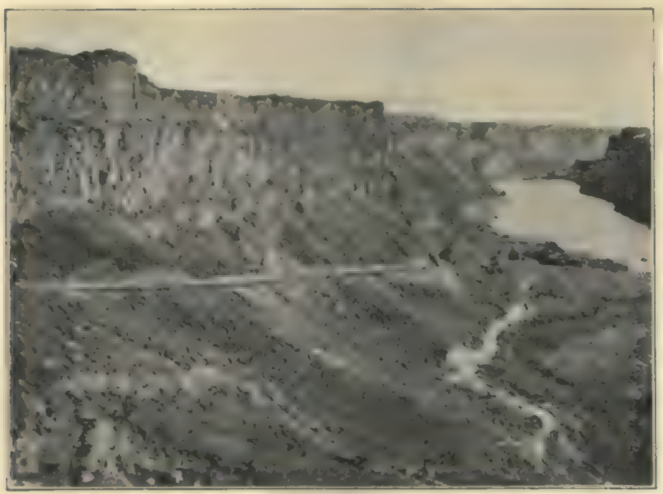
The Yellowstone Park Highway, commencing at the Targhee National Forest Reserve in the northeastern part of the state near Yellowstone National Park and extending southeasterly through Bellevue to Tikura and thence south-Rigby to a connection with the Idaho-Montana Highway at Idaho Falls, a total distance of about 66 miles.

The Sawtooth Park Highway, extending from Hailey in Blaine County, in the south central portion of the state, southwesterly through Ashton, St. Anthony, Rexburg and westerly through Richfield, Shoshone and Jerome to a connection with the Idaho-Pacific Highway near Twin Falls, a total distance of about 100 miles.

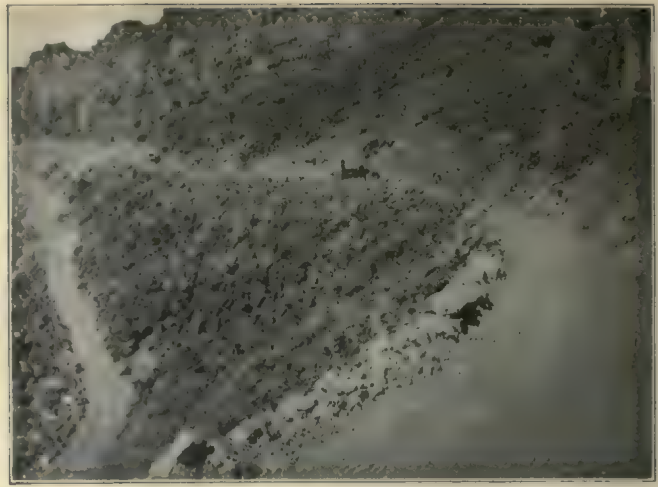
TYPICAL CANYON ROAD IN IDAHO—THE SNAKE RIVER CANYON GRADE, SHOWING RETAINING WALLS ALONG ROADWAY.

The North Pacific Highway, commencing at the Idaho-Montana line at St. Regis Pass in the northern portion of the state and extending northwesterly across the state through Mullan, Wallace and Cataldo to Coeur d'Alene and a connection with the "Apple Way," a road connecting Coeur d'Alene and Spokane, Wash., a total distance of about 82 miles.

As estimates on about a thousand miles of the highways included in these routes were desired as soon as possible, it was decided to make the surveys without the expenditure of any considerable amount of time upon refinements of location, leaving these to be worked out at the time of staking out the roads for the contractors. At the same time, it was considered worth while—and, in fact, in many cases, was absolutely necessary—to spend some time in weighing the advantages of different routes. The problem before the engineering force was to determine the best



SHOSHONE FALLS GRADE RELOCATION—PORTION OF OLD ROAD SHOWING AT LEFT.



VIEW SHOWING GRADE REDUCTION ON SAWTOOTH PARK HIGHWAY, LINCOLN COUNTY, IDAHO.

routes from the standpoints of initial cost and future maintenance, directness, and general utility to the greatest number of people. A large portion of the state is mountainous, so that the location work presented more problems than in ordinary undulating country. It was held that the most important consideration was grade, and as experience in heavy freighting had shown that the maximum grade should not exceed 8 per cent. this was made the limit; and in no case has it been exceeded in the locations made. On the longest road of the system—the Idaho-Pacific Highway—a 5 per cent. grade was developed over the entire distance, "although," it is stated in the report, "it is questionable whether or not the cost of the construction on this maximum grade through the mountains will be justifiable at this time."

COST OF SURVEYS—IDAHO STATE HIGHWAY SYSTEM.

Location of Work	Miles Surveyed	Character of Country	Season	Extent of Work Done	Average Miles Per Day	Maximum Miles Per Day	Average Cost Per Mile	Total Cost
American Falls-Raft River	33.6	Open, hilly	November	*P. & L.	1.0	3.0	$30.75	$1,033.40
Raft River-Burley	30.5	Open, level	December	P.	3.0	3.3	23.68	722.46
Bliss-Owsley's Ferry	20.0	Valley, rough	January-Feb	P. & L.	0.7	3.6	35.05	701.17
Owsley's Ferry-Buhl	20.0	Valley, rough	March	P.	3.2	4.3	15.95	319.00
Buhl-Burley	92.0	Open, level	March-April	P.	5.4	10.5	6.77	623.14
Bliss-Boise	124.0	Open, rough	May-June	P.	3.0	7.2	9.09	1,127.19
Crystal-Boise	89.0	Open, diversified	June-July	P.	5.6	8.8	4.65	413.95
Lewiston-Moscow	38.0	Open, very hilly	July-August	P. & L.	1.9	5.7	14.38	546.22
Lewiston-Reubens	52.0	Valley, rough	August	P. & L.	1.44	4.4	28.97	1,506.54
Coeur d'Alene-Cataldo	30.0	Mountainous	September-Nov	P. & L.	1.3	2.9	30.15	904.62
Old's Ferry-Crystal	36.0	Open, rough	March	P. & L.	1.7	4.4	17.48	629.33
Weiser-New Meadows	112.0	Open, rough	April-July	P. & L.	1.3	4.4	26.00	2,912.20
New Meadows-White Bird	70.0	Mountainous	November-Feb	P. & L.	0.96	2.1	43.20	3,024.57
White Bird-Reubens	71.0	Mountainous	August-October	P. & L.	1.8	6.4	24.44	1,735.56
American Falls-Utah Line	187.0	Open, rough	December-May	P. & L.	2.3	7.9	11.90	2,222.37
McCammon-Utah Line	57.0	Open, rough	June-August	P. & L.	2.8	8.1	9.07	516.56
Pocatello-Ashton	105.5	Open, level	January-April	P.	2.8	6.3	8.30	877.42
Shoshone-Hailey	62.0	Open, diversified	May-June	P.	2.5	8.0	7.77	482.15
Hailey-Mountain Home	93.0	Open, diversified	July-August	P.	1.6	6.8	14.14	1,315.11
Picabo-Arco	61.0	Open, rough	September-Oct	P.	2.8	6.0	10.15	619.13
Mountain Home-Regena	24.0	Open, diversified	July	P.	6.0	8.8	6.19	148.59
Shoshone-Twin Falls	39.0	Open, diversified	August	P.	3.9	5.5	4.76	185.80
Total miles surveyed	1,446.6							$22,566.58

*P. indicates Preliminary Line; L. indicates Located Line.

Between Nov. 1, 1913, and Nov. 1, 1914, surveys and estimates were made on 1,105 miles of roads designated as state highways and, in addition, on 160 miles of roads comprising connecting links, making a total of 1,265 miles. This work

AVERAGE CONDITION OF MOUNTAIN ROADS TO BE RECONSTRUCTED ON THE IDAHO-PACIFIC HIGHWAY.

TYPICAL VIEW OF A MOUNTAIN ROAD IN WINTER—IDAHO COUNTY, IDAHO.

was done by three regular surveying parties, with sometimes a fourth party on special work. The surveys made on state highways were as follows: Idaho-Pacific Highway, 800 miles; Idaho-Montana Highway, 50 miles; Idaho-Utah Highway, 57 miles; Yellowstone Park Highway, 66 miles; North Pacific Highway, 32 miles; Sawtooth Park Highway, 100 miles.

The number of men employed in the locating parties was kept as low as possible, in view of the progress desired. Ordinarily the parties were limited to about six men each, the usual organization being as follows:

Locating engineer, at	$125	per month
Head chainman, at	60	" "
Rear chainman, at	45	" "
Levelman, at	75	" "
Rodman, at	50	" "
Teamster-stakeman, with team, at	75	" "

The men were furnished with subsistence when in the field, a cook being added to a party when working in a sparsely settled country where board could not be obtained at towns or ranches. It was also necessary in heavily wooded country to add one or two axemen to each party.

In average country a party was supposed to cover one or two miles per day on the average, the distance being greatly increased in level, open country and decreased in wooded and mountainous country. The accompanying table shows the details of the work. As will be noted, the maximum mileage made by any party was 10.5 miles, while the averages varied from .7 mile to 6 miles per day and the average cost per mile from $4.65 to $43.20.

The Idaho State Highway Commission under which the work was done consisted of Theodore Turner, Chairman; Miles Cannon; Secretary of State W. L. Gifford; State Engineer F. P. King, and Professor C. N. Little, of the Civil Engineering Department of the University of Idaho. The work was under direct charge of Edward S. Smith, State Highway Engineer, and the location surveys were made by Locating Engineers R. E. Merrick, S. M. French, S. D. Clinton and H. E. Cornell.

Street Cleaning*

By EDWARD D. VERY†

Mr. Williston Fish in an article describing his studies of the development of cities in his transportation investigations, states that there is an analogy between the evolution of cities and that of animal life. Both begin without circulatory tubes and gradually develop until in both there is an elaborate system for the transportation of foods, fuels and air. The development of means of communication, which in the city are called streets, marks the degree of progress of a community and at the present time attempts to raise the municipal standard find their fruition in the intensive studies of those engaged in the work of city planning.

When these avenues have been laid out, the next step is the construction of a form of surfacing which shall be the proper one to withstand the wear and tear of traffic. Then comes the duty of the street cleaner who has to do with the removal of the filth resulting from traffic conditions and the offal discarded by pedestrians.

The first pavement recorded in America, according to Tillson, was discovered by a farmer, who while plowing at Pemaquod, Maine, in 1625, found the point of his plowshare caught against a curb of a buried paved street. In New York the first pavement was laid in 1676, in Boston at about the same time, in Philadelphia in 1719, in Baltimore 1781 and in Chicago in 1855. It is a matter of surprise that while pavements were laid so long a time back, effective methods of cleaning were not considered until very lately, and only just now have serious studies been made to solve the problems of efficient and economical street cleaning by competent men. This was, in a measure, due to the fact that but recently have paving experts considered the cost of cleansing to be an item to be considered in the cost of maintenance of pavements. In the main, however, it was due to the fact that the cleansing operation was considered to be an elementary proposition and, therefore, not worthy of consideration in its details by technical men.

The work of street cleaning is, in the majority of cities, performed by a bureau of some department whose other activities are considered of greater importance and the men employed are usually those who would otherwise be on the rolls of the poor-master for relief because they have attained old age without having laid by sufficient means for their support and find themselves worthless as wage-earners. Up to 1882 this work in New York City was performed by a bureau of the Police Department and in that year there was instituted by legislative act a department for the specific work of street cleaning and waste disposal. The first Commissioner, in 1889, after seven years of endeavor to put the work on a proper basis, reported to the Mayor that he found his task an impossible one because he had only partial control of street conditions and because the appropriating bodies were unconvinced of the necessity to provide sufficient funds for the institution and operation of adequate systems of cleansing. In 1895 Col. Geo. E. Waring, Jr., caused considerable merriment by taking the job of Street Cleaning Commissioner seriously and in attempting to apply engineering methods to the solution of the problems involved. Col. Waring's studies were incomplete when his term expired, but he had arrived at the conclusion that the real problem of street cleaning was the removal of the fine dust, the removal of the other materials being without comparative difficulty. The fact is that the streets are cleaner today than ever, though this is not generally believed; but the fine dust problem has become more prominent in that the low-bodied, fast-moving automobiles are raising and spreading the dust, which before was not so raised and spread except by high winds. Formerly ordinary traffic raised and spread the dust to only about the height of the infant in the perambulator and not until it was raised and blown into the faces of grown-ups was the knowledge of the continuous existence of this menace generally recognized.

In almost every large city we today find men of the caliber of Waring who are giving this matter of street cleaning serious consideration and who are applying to this work the principles of efficient and economical performance which obtain in other lines of business activity. Unfortunately the efficiency principle seems to be to get more work done for less money rather than better work done for the same cost with later endeavor to reduce the cost. The bookkeeper is the efficiency referee, whereas the practical operator observing practical results should be. Then, too, the systems are founded on hand labor with machine auxiliary. In city development large areas are being added annually and each city now may be described as "one of magnificent distances" with the result that systems must change to meet the new requirements and the basis of these should be machine work with hand labor as auxiliary. New York has 2,173 miles of paved streets; Chicago, 1,899; Philadelphia, 1,371, and the other large cities have from 100 to 500 miles. As under average conditions a man can clean but about one-half mile per day, even could he perform the work with thoroughness the cost of such an army of labor for this work would be prohibitive. Machines at present used can do from two to four miles each and as this work is done with a good degree of thoroughness, making daily work on the same area unnecessary, economical arrangement of mechanical plants may be made with good result. The man then merely polices the streets as a litter gatherer and can cover a very considerably larger route.

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Some look to the automobile machine to increase the workable area but I question if there is not a limit of speed wherein effective work may be done. The benefit to be derived by the use of motor vehicles in my judgment will come rather from the ability to adapt better mechanical method to the operation, thereby improving the quality of the work, than from increasing the amount done per machine unit. The machine broom as today operated leaves much to be desired, purely, I think, because the action of the broom is dependent upon the speed of traction, whereas should a motor vehicle be substituted, power may be transmitted to the axis of the broom independent of the tractive power of the machine, and a proper rate of revolution of the broom may be found and maintained irrespective of the speed of progress of the machine. At present if you find a particularly filthy spot and endeavor to slow up to give it more careful attention, the speed of the broom lessens and the effect is lost, whereas, were the power independent the result would be that required. A mechanical device attached to the sweeping machine to pick up the sweepings from the broom and empty into a receptacle or receptacles would avoid a considerable amount of extra work now performed because the materials are spread by the wind or tracked by vehicle tires. Such machines are in evolution now, but most of the devices are complicated or otherwise ill-adapted to the performance of this work.

Flushing machines and squeegees are now constructed which do effective work, but their adoption has been greatly retarded by the claims that the water has an adverse effect upon paving materials. Clifford Richardson, the asphalt expert, in his work on "The Modern Asphalt Pavement" says, "In a properly constructed pavement no important deterioration from water action should ensue within the life of the pavement, and, as a matter of fact, in the author's experience, the deterioration of asphalt surfaces laid under his supervision has, in the last ten years, become an item which is hardly worth consideration, where the form of construction has provided satisfactory drainage." As to the effects of water on the joints of stone and block pavements, tests made some years ago in Detroit and Cleveland showed that such action was not necessarily adverse where good construction methods had been adopted. My judgment is that the paving engineer should design his exposed surfaces to resist water action for the great benefit to be derived from water cleansing. In flushing machines there is a distinct advantage in having an attached pump to express the water so as to get positive action continuously and on all the water which the storage tank may carry. A motor flushing machine has the advantage of carrying larger quantities of water with a consequent conservation of the time now lost in frequent filling of small tanks.

The machine squeegee or rubber scrubber is effective on smooth pavements which are not too filthy, but the present method of delivery of water so close to the scrubber renders the work imperfect through the ineffective action of water on the filth before the scrubbing action is applied. This may be remedied by preceding the squeegee machines by a sprinkling cart sufficiently in advance to give the water action full effect. And here let me say that the sprinkling wagon should not be used, in my opinion, except as an adjunct to other cleansing devices, as by itself it is but a temporary makeshift and ineffective for good results. There is no reason for the filth removed by washing machines being deposited in sewer basins, but arrangement should be made for picking up the materials and carting them away as soon as they become sufficiently dry.

Dry cleaning machines are greatly to be desired and good progress is being made in the development of such. I know of two types of vacuum cleaners which are doing good work and need but little to make them practical and effective. These, of course, should be designed to pick up and place in receptacles the filth removed. When dry cleaning machine work is adopted there must still be periodical wet cleaning and such a combination should insure the best results. The system of cleansing must be so operated as not to interefere with the traffic conditions as the important factor of street use is for transportation. For this reason, in congested districts, the machine work should be done at night.

Where I have proposed a system based on the foregoing lines, it has been said that such a system applies to large cities only, while I feel that it is a basis upon which a small city may start and develop as the city's needs grow.

My proposition then is to district your city and arrange for periodic machine work so that units may be changed from one district to the other, avoiding unnecessary duplication of plant; make combinations of machine cleaning adapted to different requirements; use dry and wet methods alternately as necessity demands; have patrolmen work as litter gatherers where accumulations develop quickly, but do not necessitate machine work; in congested districts or parts of districts, do machine work at night and patrol work in the daytime; do not amploy old men on patrol, put them on park work or other less strenuous duty; keep cost data, but do not regulate your work by that, but by real efficiency; count cleansing necessities as items to be considered in the choice of pavements, and on any type of pavement design to resist action of cleansing devices; and give serious and continuous study to the needs of this department of municipal activity. So may cleanliness be attained in city streets and health and comfort result.

Mercer County, West Virginia, has voted a $350,000 bond issue for the purpose of improving 107 miles of roads.

Wabash County, Indiana, Spent $315,847.50 for road and bridge construction and maintenance during 1914 according to the report of Daniel Showalter, County Auditor. The county has 425 miles of gravel and macadam roads, 53 miles of which were completed during the past year.

The Grant Highway, a Road From Chicago, Ill., to Dubuque, Ia., is to pass through Elgin, Belvidere, Rockford, Freeport, Pearl City, Stockton and Galena, Ill., according to action recently taken by the Grant Highway Association. The road is to be marked by a device consisting of a black band between two yellow bands which is to be painted on every fifth telegraph or telephone pole along the route. The association has its offices in Rockford, Ill., the officers being George D. Roper, President, and Malcolm Mackinnon, Secretary.

The Borough of Manhattan, New York City, is Being Provided With Street Signs of a type designed to meet the requirements of Borough President Marcus M. Marks. The new signs consist of a steel plate 22 ins. long by 7½ ins. high, having at the center of the top a semi-circular projection 11½ ins. wide at the base. The main body of the sign carries the name of the avenue or street, while the semi-circular projection indicates the name of the cross street or avenue. The lettering is white, 4 ins. high, on a dark blue background, and the signs are lettered on both sides. Like the old signs, the new ones are placed on lamp posts at diagonal corners of street intersections. They are held in rectangular frames from which all unnecessary ornamentation has been eliminated in order to prevent the face of the sign from being obscured by shadows.

Report of the American Road Builders' Association Committee on Standards*

To the American Road Builders' Association:

At the Chicago Convention held in December last your Committee on Standards presented a progress report briefly outlining the work which it had undertaken and recommending that the committee be authorized to submit a fuller report at the annual meeting of the Association, in order that such report, if so ordered at the said meeting, might be printed in the proceedings for the past year, making it available for examination and discussion by the members with a view to definite action on the subject matter at the next annual convention.

At a meeting of the committee held in Chicago a subcommittee was appointed to prepare a draft of the report for submission at this meeting.

This committee has undertaken the work assigned to it in the belief that the members of the Association did not desire to have presented for its consideration highly technical specifications for the different classes of highway work. The preparation and the standardization of such specifications have been undertaken by various technical societies, such as the American Society of Civil Engineers, the American Society for Testing Materials, and the American Society of Municipal Improvements; and your committee did not think it wise to attempt to duplicate the work which is thus being done, but that it should confine itself to the presentation of certain rules and the enunciation of certain standards for highway work which could be understood and complied with by foremen, inspectors, and the great number of men without special technical training who are engaged in the work of highway construction and maintenance in the various parts of the United States. Your committee has divided its work into seven different subjects, each of which was assigned to a separate subcommittee. Some of these subcommittees have prepared quite exhaustive reports, while others have presented very little, other than a few general observations. Our report will deal with the several subjects, but without attempting a separate presentation of each, outlining first a few general principles which should govern all of those responsible for highway construction and maintenance from the head of the highway department to the humblest workman.

General Rules

A brief code of rules and instructions should be placed in the hands of every man engaged in road work. These rules should be simple, clearly expressed, and not include too much detail; they should be followed faithfully and violation of them should be considered sufficient ground for dismissal.

Individual responsibility of every man for the particular work under his charge should be rigidly insisted upon.

Every foreman or superintendent should personally see that the portion of work for which he is responsible is carried out in accordance with these rules and the specifications where work is done by contract.

Engineers, superintendents, inspectors and foremen should know the road laws of their state and see that they are enforced, and should also be familiar with employer's liability and labor laws.

Road repairs and reconstruction are inevitably attended by inconvenience, but they should not be attended by danger, every precaution being taken to warn those using the road where special caution is necessary.

Road machinery should be kept in thorough repair, especially that which during operation is exposed to dust. Use plenty of oil; paint frequently; keep extra parts on hand; see that every machine and tool is in working order; and keep all under cover when not in use.

Grass and weeds should not be allowed to grow on the shoulders of the road or in the gutters.

Grass, weeds and mud from the gutters do not furnish a good road surface. They should be removed and not placed upon the traveled road.

New material should never be placed on the road without first preparing the surface to receive it and when placed it should not be left for the traffic to consolidate.

The road roller, the scarifier and the sprinkling wagon are as essential as the small tools and they should be constantly used during the working season.

A road cannot be properly repaired in dry weather without a liberal use of water.

Culverts, drain pipes and their outlets should always be kept free.

Surface water should be carried off the road and away from it as soon as possible; it should never be allowed to get under the road.

Excessive crowns force travel to confine itself to the center of the road and thereby shorten its life.

There is almost always good local material available for construction and repair. This should not be overlooked.

The amount of material required for repairing or resurfacing the road should be determined by careful measurement, not by guess.

If no criticism of the road is heard, it does not follow that it does not deserve criticism, and improvements should not be deferred until their need is shown by such criticism.

Field Tests of Materials Used in Road Making

The following tests will prove of value in the field, but it must be understood that they are indicative only. Further and more complete tests should be made in the event of these field tests indicating unsatisfactory qualities in the material.

MATERIAL	QUALITIES REQUIRED	FIELD TESTS
Gravel (a) For Gravel road construction	Hardness and toughness of pebbles.	Breaking with hammer, rubbing and striking together.
	Grading and proportions of different sizes of pebbles, all sizes to be present.	Observation and use of screens if available. 1½-in. pebbles largest allowable.
	Shape of pebbles.	Observation — a large number of flat pebbles objectionable.
	Presence of binding material in proper proportions.	Use of screens—should not contain less than 20% or over 30% sand or clay.
	No excess of earthy material or quicksand.	Use of screens—not over 5% should pass No. 50 screen.
	Cementing Qualities.	Observation in pit. A vertical face and presence of lumps of cemented gravel indicate good cementing value.
	Mineral composition.	Observation under hand glass.
Gravel (b) for concrete roads.	Cleanliness.	Washing in jar of water and noting scum which gathers on top. Close examination of small pebbles for coating of clay.
	Grading of sizes, all sizes to be present.	Use of screens. Not more than 6% should pass 100 mesh and not more than 15% 50 mesh.
	Hardness and toughness of pebbles.	See above.
	Shape of pebbles.	See above.
	Mineral composition.	Observation under hand glass.

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* Presented at the annual meeting, February 5, 1915.

MATERIAL	QUALITIES REQUIRED	FIELD TESTS
Gravel (continued)		
(c) for concrete bases.	Same as above.	Same as above except maximum size of pebbles may be increased to 2½ ins. or 3 ins.
Sand	Hardness or sharpness.	Rubbing with fingers or between palms of hands.
	Size and proportion of pebbles.	Use of screens—all to pass ¼-in. mesh; not over 10% to pass 50 screen; not over 8% to pass 100 screen; silt and clay not to exceed 3%.
	Cleanliness.	Shaking with water and allowing to settle. Depth of scum on top will indicate percentage of earthy matter. When rubbed between palms, an excess of clay is indicated by a decided discoloration of the hands.
	Mineral composition.	Examination under hand glass.
Stone For concrete or macadam road construction.	Size.	Observation and use of screens if available. Should adhere closely to specified sizes, but a small percentage of smaller sizes is not objectionable.
	Cubical fracture.	Observation—objectionable if broken in flat pieces.
	Soundness.	Should not contain fragments of weathered rock, which is indicated by discoloration; porosity renders stone objectionable.
	Cleanliness.	Observation—if stone is not free from loam or clay, it is unsuitable for surface course.
	Toughness; not flinty.	Striking with hammer and noting manner of breaking.
	Hardness.	Scratching fresh surface with knife. Observation
Granite	Small crystalline structure.	Observation and breaking with hammer.
Trap	Cubical fracture.	
Paving Brick	Hardness and toughness.	Striking together—a metallic sound denotes hardness. Striking edges with hammer—resistance to chipping denotes toughness.
	-	Let one brick drop, flatwise on a second brick, on edge, from a height of 4 feet. Neither brick should chip or break.
	Density.	Breaking brick and noting whether texture is uniformly fine or granular. Observation.
Clay tile and Vitrified tile.	Absence of cracks. Hardness and toughness.	Striking together or with hammer and noting metallic sound.
	Uniform texture.	Breaking with hammer and noting structure. Observation.
Cement tile	Form. Sufficient curing.	Handling and striking with hammer. As above.
	Hardness and toughness and uniform texture.	Observation.
Portland Cement	Form. Proper time of setting.	Make a small pat of neat cement with 20% of water by weight and note time taken to harden sufficiently to resist penetration by thumb nail. This should not take less than one hour nor more than ten hours.
	Soundness.	Place a pat, made as above on a piece of glass, so that it is 3 ins. in diameter and ½ in. thick. Keep under moist cloth for 24 hours and then in steam at atmospheric pressure for five hours. It should remain firm and hard and show no signs of decided distortion, checking, cracking or disintegration. Another test is to make a ball of neat cement 1 in. in diameter, allowing it to dry for two hours in air. Then place it in water for from 1 to 10 days. It should show increasing hardness and no signs of cracking or crumbling. Cements failing to pass the above tests should not be condemned but should be held subject to further investigation.

Earth and Gravel Roads

Although the mileage of improved roads has grown enormously, the vast majority of the road mileage of this country is and will continue to be of earth roads with such addition of gravel or other hard material as may be readily available for the improvement of their surface. Careful location and thorough drainage will go far toward making the earth road a most agreeable surface for travel during the greater part of the year. The split log drag is the cheapest and at the same time the most effective instrument for maintaining earth or gravel roads which has yet been devised. Where systematically used and where there is proper drainage, a gravel road can be kept in very fair condition throughout the entire winter, provided the traffic is not very heavy, and it may be assumed that where there is very heavy traffic more substantial roads have been or soon will be constructed.

Sand-Clay Roads

The road made of a mixture of sand and clay has lately become recognized as a distinct type of road, and in many parts of the country is the only road improvement which is sufficiently low in cost to be practicable. This type of road has been more generally used in the Southern States than in other parts of the country, and the following notes and directions are intended to apply more particularly to that locality. Such roads have been used in New England and some other northern states where the winters are more severe, and some modifications of the methods described may be needed in such localities, while during extremely dry weather in summer it may be found necessary to use oil or other surface applications. The same care and preparation should be employed in preparing the roadbed as when the harder or more durable road materials are to be used. The portion of the road to be surfaced with sand-clay should be left nearly flat and at such a level that the shoulders will meet the pavement surface of the portion to be improved. The thickness of the surface will depend upon the character of the subsoil.

Before beginning the construction of a sand-clay road, both the sand and clay in the vicinity of the road should be examined to ascertain whether they have the right properties necessary to build a first-class road. The best sand or gravel to use is that which is sharp and not too fine. A clean, sharp grit, such as is desired in making mortar, is the quality of sand that is wanted, but the best results are obtained when the sand is coarser than that used for mortar. While any clean sand will make a sand-clay road, the sharper the grit the better the resulting road. The characteristics which are most desirable in the clay are plasticity and the ability to slake well when it first becomes wet. A clay is called plastic when it becomes sticky or dough-like when mixed with a certain amount of water, so that it can be molded or pressed into various shapes which it will retain even after it has been dried. If a lump of such clay is put in water, it will usually retain its form for a long time. There are other clays, however, which will immediately fall to pieces when placed in water as a lump of quick-lime will do under similar conditions. Such clay should be avoided. There is still another physical characteristic of clay which is to be considered from the standpoint of the road builder. Some clays shrink when dried, which is shown by the cracking and breaking up of their surfaces. Shrinkage would do no harm if the clay would stay in this condition, but it does not. When water, removed by evaporation, is restored to the sand-clay mixture, it causes the grains of sand to become separated. This property cannot be overcome, for it is inherent in the clay, but we can in some measure modify this fault by using less clay in the composition. This, however, will weaken the road and cause it to break up in dry weather. Avoid such clays if possible.

One good test for a clay is to wet the thumb and place it against the clay, and if it sticks to the thumb it is of the right quality for making a sand-clay road. If, on the other hand, it does not stick to the thumb, it is safe to say that this particular clay will not make a good binder. In general, select the stickiest clay and the sharpest sand available.

The proportion of sand and clay in the best sand-clay road should be such that there is just a sufficient amount of clay, and no more, to fill the voids between the grains of sand when these grains are touching each other. If too large a proportion of clay is used, the grains of sand are prevented from touching each other and are able to move about each other in the mass of clay, so that the resistance of the mass to the wearing effect of traffic is practically no more than if the road were composed simply of clay. Water is also able to act upon the mass of clay and the road becomes sticky and muddy. If there is too small a proportion of clay used, the grains of sand are not cemented tightly together and the road disintegrates very quickly under traffic and rain.

The exact proportion of sand and clay for making the best sand-clay road cannot be stated, as the proportions vary with the character of the sand, according to its sharpness, percentage of foreign material and size of grains. Approximately there is in a sand-clay road about 80% sand and 20% clay. One simple means of determining the proper amount of pure clay that should be added to any sand that is to be used in the construction of a sand-clay road is to fill a glass tumbler brimfull with the sand that is to be used and then fill a similar tumbler with water; pour the water carefully into the sand until the water comes flush with the surface, which will mean that all the voids between the grains of sand are now filled with water. The amount of water that has been poured into the tumbler containing the sand will represent the proportion by volume of clay that it is necessary to add to that particular sand to fill all the voids with clay.

A suitable clay may be found in the subsoil of the road, to which sand must be added; or the sand required may be the subsoil to which clay must be added; or it may be necessary to go elsewhere for both.

Method of Mixing Sand and Clay

Having determined the source of supply of the best materials for making a sand-clay road, the next question is the mixing of the materials, and this varies with the character of the subsoil, whether this is a sand to which clay is to be added or clay to which sand is to be added, or whether both sand and clay have to be hauled onto the road. It will be found that it is much easier to make a sand-clay road where the subsoil is a clay.

CLAY SUBSOIL.—The road should be properly located and graded and then the surface of the road shaped with slope from the shoulder to the ditches. The surface of that portion of the road that is to be sand-clayed should be about two or three inches lower than what is desired when the road is completed. When this is finished, the portion of road that is to be a sand-clay road, either nine or sixteen feet in the center, should when perfectly dry be plowed to a depth of three inches and thoroughly harrowed with a disc harrow. The sand should then be spread over the surface to a depth of four inches and thoroughly harrowed in, and then four more inches of sand spread over the surface, and again thoroughly harrowed. After this mixing of the sand and clay is completed, the road should be dragged. A slight crust will form, but with the first rain this will break through, for the mixed sand and clay underneath have not cemented but are loose particles. After the first heavy rain, the road should again be harrowed and then dragged into shape so as to give it the proper crown, and it will then become a firm, hard-surfaced road. If a roller is convenient, this may be used to advantage.

Very often this second mixing is left entirely to teams. In the end a satisfactory road is obtained, but it takes a much longer time.

If the sand-clay road is constructed as outlined above and good, clean, sharp sand is used on a plastic clay, a first-class sand-clay road will be the result.

In too many instances in constructing a sand-clay road the sand has simply been spread over the clay and it has been left for teams to mix it in with the clay. This takes a long time, and very often there is not a thorough mixing of the two materials, so that the road is not always uniform in its construction and does not give as good satisfaction as when constructed by the method described above.

If the sand is added to the clay road when it is wet, the harrowing can all be done at one time, and, when shaped up and dried out, it becomes a hard-surfaced road. The main objections to making the sand-clay road in this way are that unless the clay road is extremely muddy and wet the harrowing of the sand into the clay causes considerable of the clay to get into round balls, which are not broken up by the harrowing; and there is not as good a mixture of the sand and the clay as when they are thoroughly mixed dry and then harrowed later when they are wet.

SAND SUBSOIL.—If in making the sand-clay road we start with a sand subsoil and have to add clay to this, the method of procedure is somewhat different. The sandy roadbed should be left flat and then a layer of clay spread over it to a thickness of 3 to 7 inches, according to the quality of the clay and the amount of sand which it contains. If it is a very pure plastic clay, it will take a much smaller amount than if it is a very lean or sandy clay. There should then be spread over the clay a layer of clean sand and the road thoroughly harrowed. After this has been accomplished, the road should be brought back into shape and then after a heavy rain again harrowed and shaped up. There is usually a tendency to get too much clay in making a sand-clay road when the sand is the subsoil. If the clay that has been used is a very plastic clay, there is a tendency for it to ball and cake so that a plow can very often be used to advantage in breaking up the lumps. If, however, the mixing is made when everything is perfectly dry, a pretty complete mixture can be obtained by harrowing, unless the clay has been dug when it was wet.

One difference in making a sand-clay road with a sand subsoil instead of a clay subsoil is that the number of loads of clay that it is necessary to haul is much less than the number of loads of sand.

The cost, however, of obtaining a thorough mixture of clay on sand is greater than with sand on clay.

As stated above, it is impossible to determine exactly the proportions of sand and clay to use either in making the sand-clay road on a clay subsoil or on a sand subsoil; and, therefore, as the road dries out and sets, it should have careful attention after it is completed to determine whether it is necessary to add any more sand or clay. If there is too much clay, there will be a tendency for the surface of the road to get sticky or muddy in wet weather and for the clay to ball and cake, and, if this is the case, a thin layer of sand should be spread over the surface. On the other hand, if the surface of the road loosens in dry weather, it is an indication that the clay that has been used is not a good quality of clay and does not have sufficient binding power. More clay should be added and worked into the road.

Summary

CLAY BASE.—1. Have the top of the clay grade smooth and about 2 or 3 inches lower than it will be when finished.

2. Plow and harrow the top for the width the sand is is to be put on, leaving loose but smooth, with no big lumps.

3. Spread an even layer of sand about four inches deep over the top and plow and harrow.

4. Spread four more inches of sand over the top and harrow and drag thoroughly.

5. Use clean, coarse sand, even if it has to be hauled some distance.

6. When possible, harrow just after a rain.

SAND BASE.—1. Smooth the sand road, leaving it perfectly flat.

2. Spread the clay the desired width and from 3 to 4 inches thick.

3. If the sand base is clean sand, drag it up on the clay for a thickness of four inches and plow, harrow and drag thoroughly, preferably after a rain.

4. If the sand base contains loam, haul clean sand from a pit.

5. Use a natural sand-clay mixture in preference to pure clay.

Instructions for Inspectors and Foremen Engaged in Maintenance and Repair Work

Sand Roads

Roads constructed of pure sand are at their worst in dry weather. They are fairly good for light vehicles when wet but never present a hard surface except when frozen. Their cross section should be nearly level with shallow gutters. The moisture in sand roads should be conserved wherever possible. Shade trees help to do this, particularly along the south and west sides of the road. Frequent scraping with a road grader or drag is usually a waste of time. This is one type of road which is not generally improved by attempts to care for it. It had better be left alone until it can be replaced by something better.

Clay Roads

Roads which are built of clay become compact and firm in dry weather and are greatly improved by the frequent use of the road drag and occasionally of the road grader. The necessity of complete drainage is obvious as when wet such roads soon assume very bad condition.

When and How to Use the Drag

Begin as soon as the frost has left the ground and the road begins to dry. Drag soon after every prolonged rain throughout the season, and in the fall just before the ground freezes. If the frost leaves the ground during the winter, use the drag but do not attempt to use it on a perfectly dry road. Use the drag so as to force a little of the material toward the center of the road. Let the team straddle the wheel drag, going down one side and back on the other. Ride on the drag, unless the load is too heavy. Where this instrument is used thoroughly there should be a separate drag for every two or three miles of road. It is important that it should be used when and as often as the soil conditions are such as to produce the best results.

Gravel Roads

For maintaining the gravel road, as well as the earth road, the drag is the most effective machine which can be used. The surface of a gravel road will become soft during wet weather and should then have a thin layer of fresh material applied to it which will mix under travel, and the surface should be kept smooth by the frequent use of the drag. As in the case of the earth road, the gravel road should never be dragged when it is dry. The most effective time to do this work is in the late fall and in the spring when the frost is coming out of the ground and before the gravel is fully settled.

Water Bound Macadam

When a road of water bound macadam is worn thin and in bad surface, it needs resurfacing. First find out how much new stone is needed. This can best be determined by cutting a trench across the road and seeing how much old stone remains; and it is easy to compute the number of cubic yards or the number of tons, if purchased by weight, required for each mile of road. The surface of the old road should first be loosened by a scarifier, but in loosening the stone every precaution should be taken to prevent disturbance of the underlying earth foundation. After the road surface is thoroughly broken, the material may be reshaped to proper crown, by using forks and rakes, seeing to it that the fine material goes to the bottom of the layer. If this cannot be done, a screen should be used to eliminate the fine stuff and the road then reshaped. When this is completed, add the new stone, preferably of the same kind as already in the road; but when new stone is applied as a separate course of uniform depth, this is not necessary or important. But it is important not to dump the stone in piles on the grade. Dump at the side, preferably on boards, and shovel onto the grade, otherwise the surface is almost certain to become wavy. On old roads which have been worn very thin, it is best to add enough stone ranging from 1¼ inches to 2½ inches to rebuild the bottom course, and after this is thoroughly rolled apply the second course as herein described.

Care should be taken in spreading the stone to a true crown, with a fall from the center line of the roadway, of from ½ to ¾ of an inch to each foot. This fall should be maintained after the work is finished.

Rolling should be done with a ten-ton roller. It should commence at one edge of the roadway and progress toward the center, first on one side, and back on the other, the roller traveling parallel with the center line of the road; after reaching the center of the road, the roller should pass over the center of the road to make it solid. This method prevents either pushing the crown out of line or the flattening of it. A power roller is much more effective than a horse roller. If, in the first passage of the roller, any low spots are detected, they should be immediately brought to the proper level by the addition of more stone of the same size and again rolled. If laid in two courses, the lower course may be filled with screenings, sand or gravel and again rolled, but no surplus fine material shall be left on the surface. This method provides a firmer foundation and is the best practice if funds will permit.

After this, a top course of No. 2 (that which will pass a 1¼-inch screen and be caught on a ½-inch screen) should be evenly spread over the surface of the foundation with shovels or a spreading wagon. Do not permit it to be dumped on the foundation and spread either with rakes or shovels, as it is almost certain to produce a wavy surface.

Then sprinkle with water and thoroughly roll. As the rolling progresses, more screenings should be added as needed, and the sprinkling and rolling continued; when the proper amount of screenings and water have been added, a small wave of grout will be pushed along in front of the roller. The road should not be opened for traffic until dry.

Variations from the Foregoing Method

If the roadway presents an even surface, and has developed a horse track or worn traveled way for a width of, say, from 6 to 8 feet in the center, but is not much worn at the sides, a complete resurfacing is not necessary, but all holes and depressions should first be filled, tamped and rolled, after which the center or horse track may be thoroughly swept with stiff brooms and, if possible, wet or sprinkle the road surface. Then add No. 2 stone of the same kind as that used in the construction (without scarifying) to restore the crown. The application should be of sufficient depth to create a mechanical bond, and the road should be rolled after the stone is applied and brought to proper surface and grade.

Where the wear has been uniform but the surface is becoming loosened, and the edges worn thin, expense may sometimes be saved and the solidity of the road preserved by merely scarifying or picking up a narrow strip on each side of the road and thoroughly sweeping the middle surface, with stiff brooms, free of all dust and dirt, applying No. 2 stone as above directed. Sprinkle and roll to a true grade and even surface. A layer of dust will prevent the new material from bonding with the road surface, and the new layer will break up.

Sometimes, when the road is more worn, the scarifying may be reduced to shallow hand-picked grooves, about one foot apart and parallel to the center line of the road. If this plan is adopted, the road should first be patched to fill up all holes and depressions and the patches rolled. The roadway should then be thoroughly cleaned of all dust, dirt and refuse, and abundantly soaked with water, and the new stone spread to true crown and grade, and sprinkled and rolled as above described.

CAUTION.—Never put a two or three-inch blanket of screenings on the prepared foundation of your road and expect to bind or bond it by wetting and rolling. It is a waste of time and money.

It frequently happens that experience will show that the travel over a macadam road is too heavy for economical repair or maintenance. This is especially true where there is much motor traffic. This condition is made manifest by the fine binding material being pulled out of the surface, exposing the tops of the larger stone, and in many instances an examination will show that the stones are somewhat loose and not firmly bound together. In such cases it may be better and cheaper to resort to bituminous surface treatment, hereinafter described in a general way, but, if this is to be done, it is best to do it under the direction of a skilled operator or engineer.

Bituminous Surface Treatment

Many macadam roads are now repaired by what is known as surface treatment. This is essentially a modified form of bituminous construction by the penetration method. A typical example of this process is as follows: The old road is thoroughly cleaned of all dust and refuse; bituminous material of the character and quality prescribed by the engineer is applied to the surface to the amount of ¼ gallon to the square yard, followed by a uniform coating of clean screenings. These screenings should not exceed ½ inch in greatest diameter. If ruts or holes are present, they may be brought up to a true surface with screenings. The road is now rolled; another application of ¼ gallon to the square yard is made and a second course of screenings applied. Such depressions as develop should be filled with screenings as the work proceeds and a sufficient excess of bituminous material should be given to such spots. A supply of surface screenings should be left along the road when such repair methods are used, so that they may be spread subsequently to take up any excess of bituminous material on the surface.

Maintenance

CAUSES OF WEAR.—Water, if allowed to stand on a macadam surface will soften it and cause it to wear out rapidly. When the frost is coming out of the ground in the spring, the surface of a macadam road will be soft, and should be rolled. (Be careful not to roll when too soft.) The effect of horse-drawn traffic is to cause a "horse path" to form in the center of the road; the wheels in turn always going in the same place, will form ruts, particularly when the road is soft. The grinding action of the wheels wears the stone and forms dust, which in a dry state, is swept away by the wind, leaving the top stones of the surface exposed in which condition they are easily displaced by traffic. Heavy automobile traffic will cause the macadam surface to ravel very quickly when the upper stones are so exposed.

A road which is not properly maintained, quickly becomes a bad road.

To meet the above conditions, the following general rules are given:

First see that the gutters and culverts are open and clean, and the drainage is perfect.

The road shoulders must be kept smooth and free from weeds and grass. Small holes and gulleys on the shoulders and embankment should be filled up as soon as they appear.

The surface of the road should at all times be kept smooth; any chuck holes or ruts which hold water, should be filled as soon as formed, since such depressions permit water to get to the foundation, and are enlarged very rapidly by traffic. Broken stone of the same size as is used in the upper course should be used in filling depressions and ruts, and ordinary screenings should be added after the stone is tamped in, and the patch thus made left a little higher than the surrounding surface in order to allow for compression by traffic. If this cannot be done continuously, it should be done at least before and during the heavy hauling seasons. Before the stone is put in the holes or ruts, the mud or dust on the surface should also be removed as well as all grass and weeds. Dust is not only objectionable from the standpoint of comfort for travel, but it forms mud which keeps the surface of the road moist, and more or less soft for a long time.

Don't let loose stones remain on your road, and do not use them for maintenance; they will not bind.

When the road surface is so worn as to begin raveling from the loss of fine bonding material, coarse sand or stone screenings should be spread in a thin layer over the surface. The application of the coarse sand may be made along the center line of the road in a small even ridge, and is soon spread by the travel, over the width of the macadam surface. When the coarse screenings which were on the road have been worked to the edges of the road by the traffic, these should be swept back to the center of the road with push brooms.

SUPPLY OF STONE.—A supply of No. 2 stone and screenings should always be distributed along the roadside in neat piles of sufficient size to prevent scattering.

At least 16 tons of stone and 4 tons of screenings, free from dust, should be distributed along each mile of road to be maintained.

By proper maintenance, the life of the road may be doubled, and the heavy cost of frequent resurfacing thereby avoided.

WHO SHALL DO THE WORK.—Undoubtedly the best system for maintenance for the class of work above described is that which provides for a permanent force of skilled laborers or patrolmen, each of whom has a horse and cart, with hand tools, such as pick, shovel, rake and tamper, and carries a barrel of water in his wagon. Each patrolman (in extreme cases, one or two helpers) should have charge of from 3 to

10 miles of road according to width, traffic and climatic conditions. He should be employed continuously for 8 or 9 months in the year and, in some places, all the year. The cost of this service ranges from $75 to $125 per mile of roadway 15 feet wide, according to price of labor and conditions.

Under some conditions, a combination of the gang and the patrol systems may give the best results. In these cases the patrolmen look after their particular sections of road during certain seasons, say, late spring, summer and early fall, and at other times, late fall and early spring work in small gangs. They can thus do work that requires more than one man's services. The assignment and regulation of the work of the patrolmen, should be left to the engineer in charge of the work.

The Care of the Roadside

There has been a general disposition to regard the care of the roadside as desirable but unimportant, except that proper drainage is generally recognized to be of fundamental importance. The care of the roadside, however, is of greater importance than is generally realized. Shade trees are beneficial and will add to the life of the road surface. Aside, however, from the beneficial effect upon the road itself, the appearance of the roadside and its attractiveness to those traveling upon the highway have been too generally ignored. Scores of millions of dollars have been expended annually in this country on road surfaces, and a slight additional expenditure to make our highways more attractive is certainly justified. Roads are commonly laid out at a width of at least 50 ft., often 66 ft., and frequently 80 feet., while a very narrow strip, usually not more than 18 ft. in the central portion is devoted to travel. It is generally admitted that the shoulders and the side ditches should be kept free from grass and weeds and that the flow of surface water should be unobstructed; but what about the remainder of the space within the side lines of the road? It is usually ragged, unkempt and slovenly. Very little tree planting is done, and were it not for the foresight of preceding generations many of our roads would be entirely destitute of trees. It is true that the space at the side of the road is needed for the storage of material used in maintenance, but that such a use is not inconsistent with a neat and attractive appearance of the roadside is obvious to anyone passing along the highways of Great Britain or Continental Europe. Although the English roads are much narrower than those in America, the hedge rows and trees which line them are well kept and form charming road pictures. The great national roads of France are almost invariably planted with trees on both sides and as these roads commonly run in straight lines across the country from town to town, these rows of well kept trees are a conspicuous feature of the countryside. Our roads are being improved to attract travel. Why then should not more attention be given to the appearance of the roadside instead of devoting all of the study and the funds to maintaining the surface of the traveled way? This is done in other countries; it is done in certain parts of the United States, especially in Massachusetts, and it should be accepted generally as an important phase of highway improvement and maintenance.

Dust Preventives

Expedients for dust prevention, for roads in the open country, should be considered in relation to each particular road or type of road, and there are involved as important factors:

- (a) Probable traffic on the road.
- (b) Materials economically available for construction.
- (c) Funds and organization available for construction.
- (d) Funds and organization available for maintenance.

Assuming the three latter (b), (c), and (d), to have been established, the question is mainly one of adapting dust preventives to various types of road in a manner suitable to traffic over them. We have, therefore, to consider:

1. Materials and methods of dust laying.
2. Types of material available for the road surface.
3. Gradation of traffic.

1. Materials and Methods of Dust Laying

A. These in general consist of purely surface or carpet treatment such as:

- (a) Water sprinkling.
- (b) Mineral Oils:
  - (1). Asphaltic base,
    - Heavy for hot application,
    - Light for cold application.
  - (2). Paraffin base.
- (c) Asphalt with naphtha:
  - Heavy for hot application,
  - Light for cold application.
- (d) Tar:
  - Heavy for hot application,
  - Light for cold application.
- (e) Asphaltic Emulsion.
- (f) Oil Emulsions.
- (g) Calcium chloride.

B. Dustless construction, including:

- (a) Bituminous concrete on,
  - (1). Concrete foundation,
  - (2). Telford, broken stone or gravel foundation.
- (b) Bituminous penetration on
  - (1). Concrete foundation,
  - (2). Telford, broken stone or gravel foundation.
- (c) Vitrified brick, stone, wood and other block pavements.
- (d) Cement concrete,
  - (Glutrin, Rocmac, or other partially dustless construction.)

2. Types of Surface Material Available

It is commonly desirable to construct roads of the most suitable material available in the locality. These may be considered under:

1. Sand.
2. Gravel.
3. Soft broken stone, such as limestone.
4. Hard broken stone, such as granite or trap.
5. Vitrified brick, stone, wood and other blocks.
6. Concrete.
7. Two or more of the foregoing, permitting selection for foundation and surface.

3. Gradation of Traffic

Standards of traffic intensity have not been officially established by any organization, but are much needed. The following clasification is suggested as including all material variation of traffic:

Horse-drawn Steel tires.	Pleasure vehicles.	Single horse, Double or pair.	
	Farm or Commercial vehicles.	Single	Loaded, Not loaded.
		Double	Loaded, Not loaded.
	Extraordinary.	Quarry, brickyard or other regular and destructive traffic.	
Self-propelled Rubber tires.	Pleasure vehicles.	Less than 7-seat motor. Seven-seat or over.	
	Commercial trucks.	Loaded. Not loaded.	
	Extraordinary	Motor bus or other special traffic.	
Self-propelled Steel tires.	Steam lorries and tractors, with trailers, etc.		

As a simplified classification, for the present purpose, with standards of traffic, the following is suggested:

1. Horse-drawn Steel tires.	A.—Light vehicles.	(1) Light—up to 100. (2) Medium—100 to 200. (3) Heavy—200 up.
	B.—Heavy vehicles, wagons, trucks.	(1) Light—to 75. (2) Medium—75 to 150. (3) Heavy—150 up.
2. Self-propelled Rubber tires.	C.—Passenger automobiles.	(1) Light—up to 100. (2) Medium—100 to 400. (3) Heavy—400 up.
	D.—Motor trucks and buses.	(1) Light—up to 10. (2) Medium—10 to 20. (3) Heavy—20 up.
3. Self-propelled Steel tires.	E.—Steam lorries and tractors.	(1) Light—1. (2) Medium—2 to 6. (3) Heavy—6 up.

In further reference to traffic, the various factors of the foregoing schedule will be described by letter and number thus:

A (3), B (2), C (2) would mean "Light vehicles, heavy traffic—heavy vehicles, medium traffic—passenger automobiles, medium traffic."

Conclusions

(1) Surface material.	(2) Maximum traffic on which it can be considered.	(3) Treatment for dust.	(4) Remarks.
1. Sand.	A1+B1+C1	Asphaltic oil hot application. Calcium Chloride.	A temporary form of improvement, if sand is coarse and other durable material not available.
2. Gravel.	A2+B2+C3+E1	Asphaltic oil cold application.	Should have careful maintenance proportionate to traffic; using the log drag weekly —temporary.
3. Gravel	A2+B2+C3+D1*E1	Bituminous penetration or mix.	Less constant maintenance required and more durable. Life of surface 5 to 10 years with reasonable care.
4. Broken stone, soft, water-bound.	A2+B2+C2+D1+E1	Oil, paraffin base.	Temporary treatment.
5. do	A2+B2+C2+D1+E1	Asphaltic base, cold.	Treatment more lasting.
6. do	A2+B2+C3+D1+E1	Asphalt base, hot.	Treatment more lasting than preceding.
7. do	A2+B2+C3+D1+E1	Tar, cold.	Treatment more lasting than preceding.
8. Broken stone, soft.	A3+B2+C3+D2+E1	Bituminous.	Greater durability requiring annual or biennial carpet coats.
9. Broken stone, hard, water-bound.	A3+B3+C3+D2+E2	Bituminous. concrete or penetration.	Subject to treatments given in 4, 5, 6 and 7, but with greater durability.
10. Concrete	A2+B2+C3+D2	....	Usually dustless in open country requiring occasional sweeping or scraping in places.
11. Vitrified brick stone setts and wood block.	A3+B3+C3+D3+E3	....	

In the foregoing no consideration has been given to character of foundation, which should be recognized as an essential part of the construction for dustless conditions. The foundations required by the several classes of traffic should be adequate to the loading, and for B3, D and E, special provision must be made.

In the use of carpet coats, a thin film should be sought, rather than a thick covering.

In the case of light oils, care must be taken that sufficient oil is not used to create, after a series of applications, a deeply lubricated surface layer, such as tends to "a wavy condition."

For further consideration:

Relative values of pea gravel, limestone chips, trap and granite chips, sand, etc., for applying to an oiled or tarred surface.

Value of pea gravel, trap or granite chips, as a dust layer.

Etc., etc., etc., etc., etc., etc., etc.

Committee on Standards,
By Nelson P. Lewis, Chairman,

Committee on Standards:

Nelson P. Lewis, Chairman
Henry L. Bowlby
A. W. Dean
A. B. Fletcher
S. D. Foster
C. A. Kenyon
W. A. McLean
R. J. Potts
Joseph Hyde Pratt
Frank F. Rogers
George W. Tillson

The Necessity of Study After Graduation

In a paper of the above title, presented at a recent meeting of the Alabama Association of Highway Engineers, J. B. Converse, City Engineer of Selma, Ala., said, in part:

"In selecting the subject, 'The Necessity of Study After Graduation,' I assure you I did not do so with the intention of benefiting the experienced engineers present, but with the hope that it might stimulate you to encourage the younger men with whom you come in contact—the engineers of tomorrow—to keep on with their study. How well do graduates appreciate after a few years have elapsed the deeper significance of the word "commencement," the beginning.

"When a man leaves one of the technical schools after a course of study he has had placed in his hands a set of tools. In what stage of perfection they are depends upon the natural ability of the man and how he has applied himself during the years of study. Be that as it may, is he going to let those tools become dull through carelessness? If his work requires only part of them, is he going to let the remainder grow rusty for the want of a drop of oil? Any moment the unused implements may be of valuable service if they are sharp and ready. An engineer leaves college highly theoretical, but before he can apply those theories properly he has to have the practical side also and so he starts in the school which has no graduation day—the school of experience. How can he gain experience other than by actually performing the work? By study and observation. But what is intelligent observation but study? Engineers should heed well the old warning of the Bible, 'They have eyes, but they see not.'

"The profession of engineering covers such a vast field of work, from the designing of bridges to roads and pavements, that few men reach the heights of success unless they specialize in some one branch. But because a man has selected highway engineering for his life work is that any reason why he should allow all knowledge he may possess of sewerage and sanitation to slip from him? Or should the sanitary expert forget the principles of stress and strain? 'To read and retain' is a pretty good motto for us. Read engineering papers, read the papers of engineering societies, read text books. But when you pick up an engineering paper and see how the span of a large bridge has been successfully moved, or how an underground survey of a city has been conducted do not skip over it simply because at the moment you are building roads and are not scheduled to do any similar work in the immediate future. But above all, read intelligently, do not read words; instead read ideas, read thoughts. * * *

"When conditions arise in our work with which we are not familiar let us not stop until we master them. By correspondence and diligent search we will be rewarded. The line of least resistance is very tempting at times, but keep away from it. There is no standstill. If we do not advance we retrograde. Above all, let us not become machines, but give to each job the best that is in us; and this requires continual study, for each problem is a new one. Then as time goes on we not only gain experience, but we grow more experienced in gaining experience, and one of the greatest factors in such development is a continuation of study after graduation."

The Commissioners' Court of Lavaca County, Tex., has set June 29 as the date for an election on a road bond issue of $150,000 in the Shiner Precinct.

July 29 Will be Good Roads Day in West Tennessee. Each county will be divided into squads in charge of a foreman and the entire work will be done under the direction of the West Tennessee Business Men's League.

Pavement Widths and Crowns[*]

By **H. J. FIXMER**[†]

As a general policy, the length of road improved is more important than the width. This rule does not often apply to city streets. The determination of proper width of roadway is an extremely important element in design.

A traffic census is often desirable, but unless it is truly comprehensive, more can be learned by direct and frequent observation of the street in hand. A traffic census must give not only number and size of vehicles, but the different kinds, kinds and sizes of tires, wheel loads, rates of speed, space required for storage and parking, and character of adjoining property.

It is customary to allow 8 ft. in width to each line of vehicles, reducing this width as shown in Table I. Where two car tracks are built, not over 10½ ft., center to center, a width of 20 ft. is allowed for the free movement of the cars. Table II shows widths and lengths of typical vehicles found on the streets of Chicago.

Unless the traffic exceeds or promises to exceed from five to ten vehicles a mile moving in either direction, 9 ft. in width should prove ample on our country roads. It is better policy to build a so-called "permanent" road 9 ft. wide (with a 5-ft. earth shoulder on each side) than a poor road 18 ft. wide. In view of the fact that perhaps over 90 per cent. of the time the vehicle occupies the middle of the road, and even in practice on the wider road usually prefers to suffer the slight inconvenience of turning out occasionally in order to ride on the more comfortable or acceptable part of the road, it appears logical to give due weight to this factor of "practical use." If a 9-ft. permanent road is built additions can always be made whenever the traffic warrants it. When consideration is given to the habits and needs of the users of the roads, the soundness of the policy that length of permanent road is more important and desirable than width is soon appreciated.

In city pavements the use of the street for "storage," or rather provision for vehicles to stand alongside or backed up to the curb in front of abutting property, must be considered and is a vital factor in ascertaining the rational width of roadway.

Thus, in the case of a street having many warehouses, where large trucks back up to the curb to handle goods, we would, after finding that this condition prevails on both sides of the street and that allowance must be made for two lines of moving traffic between the "standing" trucks, determine the roadway to be not less than 2 times 8 ft. plus length of truck backed in position. From Table II this would give 2 (8 + 14) or 44 ft.

In residence districts, where connecting streets are paved as a system, the roadways on all streets where the lots front are made 24 to 30 ft. wide and side frontage streets 18 to 24 ft. wide.

Perhaps the most serious condition in securing adequate roadways exists on streets having a double-track car line.

Such streets are invariably "business" streets and require "storage" space for vehicles and automobiles. On such a street, providing for two lines each of street railway cars, moving vehicles and "standing" vehicles, we find a width of 2 (8 + 7 + 10) or 50 ft. is required. If the moving traffic is expected to use the car tracks, and the service on the street railway is infrequent, the width may be reduced to 2 (8 + 10) or 36 ft. A roadway width between 38 and 48 ft. in this case would be wasteful.

TABLE I.

Width of Roadway, ft.	Type of Street Usually Applied to	No. Lines of Vehicles Providing for	
9	Average or Light Traffic Road	1	
16-18	Side Residence Streets or Double Roadway Streets	2	
24	Residence Streets	3	
30	Residence and Business Streets	4	
38-42	Business and Car Line Streets	5	(Exc. 4 on car line)
48-52	Business and Car Line Streets	7	(Exc. 6 on car line)
60	Business and Car Line Streets and Boulevards	8	(Exc. 6 on car line)

TABLE II.

Kind of Vehicle.	Width, Hub to Hub, ft.	Length, Backed to curb, Front Wheels at Right Angles, ft.
Delivery Wagon	5.5 —6.7	8.7
Single Truck	5.8 —6.0	11.4
Large Truck	6.4 —6.6	12.8—14.0
Newspaper Truck	7.75	14.75
Touring Car	5.5 —5.8	10.0—16.0
Auto Truck	6.7 —*	12.0—?

* Widest truck measured 9.5 ft.

On a certain main artery in Chicago, where a double car line exists and the roadway is generally but 38 ft. wide, with stores continuously on each side, the unnecessary delay occasioned to the passengers on the street cars by teams and vehicles turning on and off the street railway right of way to pass standing vehicles amounts on the average to two minutes per mile traveled. This means that each passenger living an average of 5 miles from his work loses twice five times two, or twenty minutes, a day. Assuming a low value for his time of 30 cts. an hour, the total extra loss to the car users equals the gross receipts of the street railway company! This sum capitalized indicates the sum that might be employed to reduce or rather remove the existing street congestion.

A street car that makes good time attracts more people and gives more time to shop, while it distributes business uniformly along the street. For this reason, when a street becomes too congested it becomes necessary to widen the street or place the car line on an elevated structure or in a subway. It is an extremely important question to decide whether it is better to build a subway in a congested business street or use the money to widen the street and keep the car traffic on the street surface in the open air and easily accessible.

The contour of the pavement surface is a matter of more than ordinary importance. For the purpose of drainage the pavement is built with a convex curved surface; the difference of height of the surface at the center line and gutter line being called the "crown." Table III shows the constants employed to determine the crowns of various types of roads and the maximum and minimum values for the constant, as used in Chicago.

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[*] From a paper entitled "The Design of Pavements," presented at the thirtieth annual meeting of the Illinois Society of Engineers and Surveyors, Springfield, Ill.

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As usually built the surface is either an arc of a circle or a parabola. Experience has demonstrated that the parabola form (Fig. 1) is preferable for residence streets, and the "compromise" form (Fig. 2) is more satisfactory on business or "car line" streets, and particularly for pavements having a macadam base.

Country roads can usually be built with a constant crown since they follow the contour of the natural surface and have sufficient longitudinal grade. If the grade is level the drainage can be taken care of by sloping the grade of the side ditches.

With city streets, which are invariably curbed, if the longitudinal grade is not sufficient to carry off the water, drainage must be provided by "artificial" means. This is done by building sufficient sewer inlets and establishing "summits" in between, whose locations depend upon the grade of street, slope required to drain, and the permissible depths below the curb of the summits and the inlets.

TABLE III

Kind of Pavement.	Chicago Average Constant "F"	Max. "F"	Min. "F"
Earth	.025		
Gravel	.022		
Macadam	.020	.035	.020
Asphalt	.012	.025	.011
Asphaltic Concrete	.015	.025	.012
Brick	.012	.025	.010
Creosoted Wood	.010	.022	.010
Granite	.015	.025	.010
Concrete	.010	.020	.010

Formula 1.

$C = WF$

where

C = crown, in inches.

W = width of roadway, in feet

F = a constant.

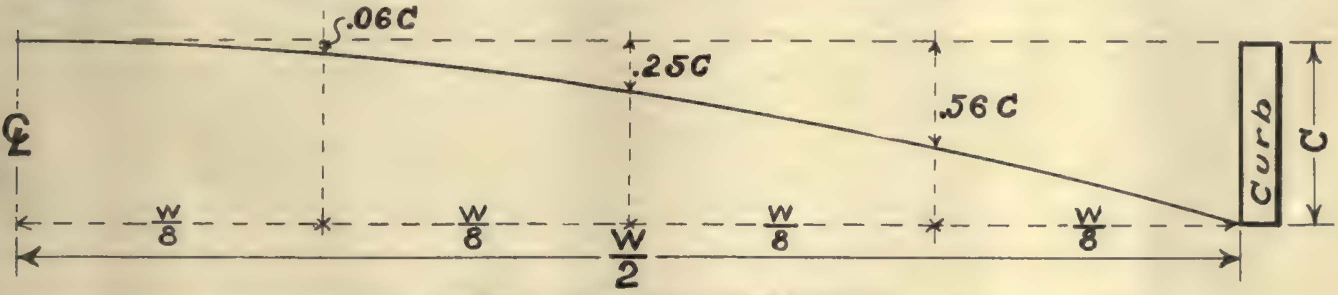

FIGURE 1—PARABOLIC CROSS SECTION.

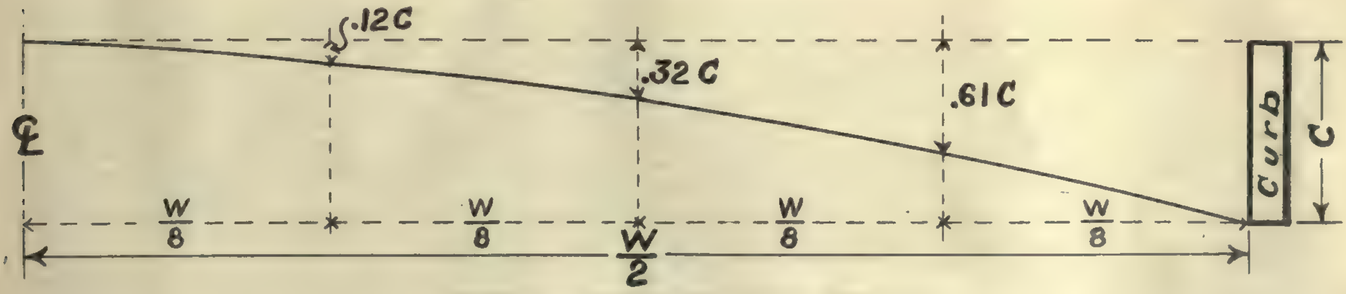

FIGURE 2—COMPROMISE CROSS SECTION.

The following formula is given for locating summits (in the gutter):

Formula 2: $$X = \frac{L}{2} - \frac{D}{2R}$$

where
X = Distance of summit from *higher* inlet;
L = Distance between inlets;
R = Grade of gutter (e. g. 6 ins. fall per 100 ft. = .005);
D = Difference of elevation at inlets (or, usually, the difference in elevation of curb at inlets); all in feet.

On a concrete gutter the assumed value of "R" should not be less than .004. For any block pavement, including alleys, the value for "R" should be not less than .005.

The following formula is given for determining depth of summit and depth of inlet below curb (or grade) to satisfy values in Formula No. 2.

Formula 3: $$J = K + RX + \frac{DX}{L} \text{ or } K = J - RX - \frac{DX}{L}$$

where
J = Depth of inlet below curb (from 8" to 12");
K = Depth of summit below curb (usually 3").

The minimum crown from Table III is used at the summits, and the maximum crown is permitted at the inlets. This reduces the grade along the center line of the pavement to about one-half the gutter grade, and gives a comfortable surface to travel on.

"The Utilization of the Motor Truck in Highway Work."

In the article appearing under the above caption in the issue of May 1, there inadvertently appeared one incorrect statement to which we would call our readers' attention.

Near the foot of the first column on page 175 it was stated: "The first eight columns in Table III. are taken directly from the two tables referred to, while the data in the last three columns have been calculated from the other data on the assumptions given in the notes accompanying the table." This should read: "The first five columns in Table III.," etc., instead of "the first eight columns." As originally made up the table contained eleven columns, the first eight of which were taken directly from the other tables referred to, as stated. Later three of these columns were eliminated, leaving five taken from the tables of the Lee Loader Co., to which reference was made, and three which were calculated therefrom, as stated in the article. Through an oversight the necessary correction was not made in the text.

Voters of Wilson County, Texas, have voted an additional tax of 15 cts. which will yield about $200,000 for good roads.

The Board of Supervisors of Contra Costa County, Cal., has approved plans for a $120,000 bridge with a 542-ft. span across Old and Middle Rivers at Martinez. San Joaquin County will share the expense of the improvement.

The Taylor Good Roads Association has been formed in Taylor Borough, Pa., and the following officers have been elected: President, James Morris; Secretary, David B. Monie; Treasurer, Reese Jones.

Clean-Up Week in the City of New York

The week ending Saturday, May 8, was "clean-up-week" in the Boroughs of Manhattan, the Bronx and Brooklyn, New York City. As stated in "Good Roads" for May 8, considerable extra work was performed and, although some extra teams and men were employed in a few sections, in most instances the Department of Street Cleaning was able to control the situation with its regular equipment.

The department compiled no figures to show in detail the amount of work accomplished, but it was stated that the greatest increase in the number of loads handled was in the Borough of Brooklyn, where the record ran 245 loads above normal. However, this occurred on one day only, the work for the remainder of the week being little, if at all above the average. Manhattan and the Bronx reported some increase in the number of loads handled, but the excess was by no means extraordinary. The cost of such extra work as was performed was kept well within the department's regular appropriation, there having been no special appropriation for the purpose.

In commenting upon the matter, Commissioner Fetherston of the Department of Street Cleaning, attributed the small increase in the amount of rubbish handled to the fact that, under the present administration, every working day in the year has come to be regarded as "clean-up day" as evidenced by the fact that an average of about 8,000 loads of rubbish is handled daily in the Borough of Manhattan alone and the accumulations, therefore, were comparatively small.

NEW DUMP OF THE NEW YORK STREET CLEANING DEPARTMENT, AT 72D ST. AND EAST RIVER.

For some time past the department has been conducting a campaign of education in the matter of clean streets, by means of circulars, advertisements, newspaper and magazine publicity and lectures to public school children, illustrated in many instances by moving pictures and stereopticon slides. Recently a series of placards has been printed and a set of twelve furnished to each driver of a paper and rubbish cart. These cards are used in pairs and are carried in substantial galvanized iron frames on either side of the carts, as shown in one of the accompanying illustrations. They are printed in large black letters on a white ground and are changed every week. The legends are as follows:

"You live in the greatest city in the world. Let's make it the cleanest and healthiest."

"Let us work together for a city that is beautiful, healthful, decent, orderly, safe. Don't litter the streets."

"Remember the three Deadly D's—Dirt—Disease—Death."

"Help to keep your city clean. Use separate and large enough receptacles for garbage, ashes and waste paper."

"The best public service depends on cooperation and mutual understanding. Will you help? Keep the garbage can covered."

"It's your street in your city. Keep it as clean as you do your room in your home."

"It's your street. Why not put dust and litter from the pavement into a can and not sweep it into the gutter?"

"Don'ts for clean streets: Don't spit on the pavement. Don't make a dump of your street. Don't leave the garbage

PARADE OF STREET CLEANING DEPARTMENT FORCES—BROADWAY, BOROUGH OF MANHATTAN, NEW YORK, N. Y., "CLEAN-UP WEEK," MAY 3-8, 1915.

PAPER AND RUBBISH CART ABOUT TO DISCHARGE LOAD AT STABLE B DUMP, 47TH ST. AND NORTH RIVER.

NEW TYPE OF COVERED ASH CART USED BY THE NEW YORK STREET CLEANING DEPARTMENT.

can uncovered. Don't throw paper, banana skins, etc., into the street."

"Clean homes and clean streets mean fewer flies, better babies, healthier children, happier homes."

"Clean streets increase business and improve property values. Don't let your waste paper blow about."

"Don't wait for clean-up week. Do it now. It's your street and your city. Help to keep them clean."

"Put out your rubbish every day. The city is ready to cart it away."

That the efforts of the department along educational lines are bearing fruit is evidenced by the reports of district superintendents and by the comparatively small amount of extra work necessitated by the recent "clean-up week."

The Highway Situation in Wyoming

That there should be established in the State of Wyoming some central authority to compile records of what has been done in road building in the various counties of the state, to collect data on the location of suitable road building materials and to determine the most efficient methods of utilizing those materials, is the substance of recommendations which were made by Deputy State Engineer H. G. Watson, of Wyoming, in the annual report of the State Engineer, for the years 1913 and 1914. As no such provision was made by the 1915 Legislature, the situation remains unchanged, so far as state participation in road work is concerned, except that the Legislature appropriated $5,000 for the purchase of equipment and supplies to be used in the employment of prisoners upon the public highways during the two years ending March 31, 1917.

Under laws passed in 1911 and amended in 1913, roads having a total length of some three thousand miles have been designated as state highways. The laws provide for the employment of state convicts in the construction of these roads and also provide that the highways shall be located under the direction of the State Engineer, the county, however, being required to pay for the work. As the result of this, the State Engineer has had very little to do with the location of these roads except to advise with the county commissioners and to arbitrate disputes when different counties were unable to agree upon a route. It was stated in the report previously referred to, that up to the date of that document only six counties had cooperated with the office of the State Engineer by providing for surveys for the location of such highways and that in many counties it had been impossible to do anything on account of a hesitancy on the part of the county commissioners to incur any expense. The six counties in which work had been done were Laramie, Albany, Carbon, Uinta, Converse and Park. The total mileage of roads located in these counties was something over 300 miles.

It was estimated in Mr. Watson's report that the construction of the highways in the entire system would cost at least $15,000,000. It was pointed out, however, that it would not be necessary to expend that amount immediately, but that by properly locating the roads, grading could be carried on as funds became available. It was also pointed out that by doing the grading within the next few years the fills would have several years in which to settle.

In regard to work done by the counties, the report stated that during the five years from 1909 to 1913, inclusive, the counties had expended $1,535,817.42. Adding to this the amount expended in 1914 would make a total expenditure in the past six years of very nearly $2,000,000. In some counties, according to the report, there is a disposition to place at least the main roads in condition for all kinds of traffic, while in others no roads are repaired except when it is absolutely necessary. It is also stated that, as a rule, the roads which the county authorities are most inclined to improve are those radiating from the county seats, as these are the roads most used by the taxpayers and voters; therefore roads connecting the different counties are generally left until the last. The result of this, it is pointed out, is that there is little or no money left for the roads of the state highway system after the other roads have been placed in passable condition.

Among the conclusions drawn by Mr. Watson are that unless some way can be devised to provide for the assistance of the state in the construction of the highways, "it is certain that many years will pass before Wyoming will be able to take its proper place in the list of good road states;" that some restrictions—possibly state control—should be placed on the construction of bridges; that pending the development of more interest in the construction of roads by the state, or under the supervision of the state, valuable and necessary information could be obtained by detailing an engineer from the office of the State Engineer to compile data on road work already done, to advise with local officials and to study available materials and the best method of utilizing them; and that as the state can provide but a small number of prisoners for road work some provision might be made for working county prisoners on the roads or in the preparation of road material.

The Council of Defiance, Ohio has authorized paving improvements which, according to estimates, will cost about $80,000.

The Lack of Progress in Methods of Earth Road Location[*]

By W. C. FAWCETT, C. E.[†]

We are wont to boast about our advanced civilization, and point with pride to the fact that in most all lines of human endeavor our progress has been little short of marvelous. The dreams of yesterday are the realities of today. Invention has crowded on invention, and an improvement has hardly been announced until the improvement has been improved.

We have been "going some" in many directions, but in one particular direction we have only been marking time. For instance, what have we done in the last hundred years toward improving our methods of locating and constructing earth roads?

To illustrate, let me read you an extract from the Commissioners' Journal of Belmont County under date of November, 1804:

> It is ordered that a view and survey be made of a road beginning at the mouth of Captina Creek; thence up said creek, the nearest and best way that the situation of the ground will admit, until it intersects the road leading from John Dilles Ferry to the salt works at or near the mouth of Rock Fork of Captina Creek; therefore George De Long, David Gillespay, and Thomas Harrison are appointed to view and Archibald Wood to survey the same and make a return of the same according to law at the annual meeting of the Commissioners on the second Monday of June next.

On date of June 12th, 1805, the Commissioners' Journal contains the following entry:

> A return was by the viewers of a road from the mouth of Captina Creek to intersect the road leading from John Dilles Ferry to the salt works. And return was made that in their opinion the road will be of general and public utility; and the surveyor returns a plat of the same. The Commissioners order that the supervisors through whose districts the same shall pass, cause the same to be opened up a necessary width not to exceed 66 ft., and in other respects convenient for the passage of wagons and travelers.

In the Commissioners' Journal of the same county in 1905 we find the following entry:

> In the matter of the petition of W. G. McComas et al. for the alteration of a county road in Pease Township, it is ordered that W. L. Patton, Washington Kennedy and William Alexander, three disinterested freeholders of Belmont County be, and they are, hereby appointed viewers, and John A. Bond, Surveyor, of said road and that they meet at the La Belle House, in Bridgeport, Ohio, on the 15th day of September, 1905, at 10 o'clock a. m. and after being duly sworn proceed to the duties of their several appointments according to law.

The requirements of the law in each of the cases cited were the same, and were met in the same way; the viewers located the road and the surveyor merely recorded and platted up their work. Perhaps some vertical angles were taken to see if the grades ran above 5 degrees but this is not a matter of record.

The plats filed with earth road surveys in 1805 and the ones filed in 1905 are as much alike in general features as two peas. There is no profile and no grade line, and the alignment consists merely of a zigzag line without any curvature shown.

It seems almost incredible that in this progressive age the old system of locating earth roads by viewer is still in vogue. The system met the requirements of 1805 fairly well. Engineers were few, the population was sparse, labor and funds were not available to build roads of the character needed today. The system served the purpose in those days, just as did the flail and scythe and sickle, and should have passed with them. These primitive tools have been supplanted by modern labor saving machinery, but the viewer still goeth forth to view. The stage coach has given way to the solid vestibuled train, and still the surveyor takes to his assistance Smith and Brown as chainmen, who, being duly sworn, proceed to measure the road as best they can. And so the merry farce goes on.

I do not question either the intelligence or integrity of those who may serve as viewers, surveyor or chainmen; but I do claim that it is not a good working combination. Just so long as the viewers are the principals and the engineer merely the accessory, and at least some knowledge of engineering is not considered a condition precedent to serving as a viewer, this method must, of necessity, fail to reach the desired end, especially in hilly or mountainous sections, where the skill of the experienced engineer is taxed to obtain satisfactory results.

This method of locating earth roads exists simply because the people who use them are not alive to the advantage of roads having better grade and alignment, or they are so lacking in progressiveness that they would rather bear the ills they have than make the effort necessary to better their condition.

The farmer readily adopts improved machinery and methods because he can see that by so doing his labor will be lightened and his products and profits increased; it is to his personal interest, and he is willing to spend money to make more money. In matters of community interest, however, the money is not so readily forthcoming, and pursestrings are more tightly drawn. Here is a matter in which the profits are not so direct and tangible, and for that reason financial support is not so freely given, and we frequently hear the remark, "I am not going to help build a road for other people to wear out." To this narrow view of the good roads question is largely due the fact that we are still following antiquated methods in locating earth roads and slip-shod methods of construction without any particular reference to alignment or grade. We will drift along in much the same fashion until people realize that the best road is the cheapest; that money spent for proper location and construction is well spent and will in due time bring satisfactory returns. Primitive methods of road location should be abandoned forthwith, "the public welfare demanding it," and the work put as squarely on an engineering basis as is the location of railroads and traction lines. There would, of course, be differences in detail but none in principle.

There is no good reason why the location of earth roads should not receive the same careful professional treatment by the engineer that would be given to the location of a railroad. The facts that the grade limit and curve limit on earth roads is higher than on railroads, and that funds are never any too abundant, make all the more urgent the necessity for good professional work on the part of the engineer, to the end that the best results may be obtained. It is not difficult to locate a cheap road in our hilly country if a liberal use is made of the maximum curvature and grade, but the good location is the one in which the least possible use is made of the maximum curvature and grade and the cost of construction still held to a reasonable figure.

A Bond Issue of $250,000 has been voted in the Sarasota Bay district of Manatee County, Florida. The issue carried by a large majority, 144 votes being cast for it and 26 against it. The money from the bonds will be used in the construction of about 34 miles of sand-asphalt roads and a bridge to Sarasota Key.

A Lecture Course in Road Building and Maintenance was given at the Maryland Agricultural College, College Park, Md., in March. The course occupied an entire week and comprised lectures by members of the staff of the Maryland State Roads Commission, members of the faculty of the Maryland Agricultural College, engineers from the U. S. Office of Public Roads and others. The course was given for the first time this year and it is planned to make it an annual affair.

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[*] From a paper entited "Location of Roads in Hilly Country," delivered at the Winter Good Roads School of the Ohio State University, January, 1915.

[†] Martins Ferry, Ohio.

New State Highway Officials in Pennsylvania

As has been noted in previous issues of "Good Roads," Robert J. Cunningham has succeeded E. M. Bigelow as State Highway Commissioner of Pennsylvania and William D. Uhler has succeeded Samuel D. Foster as Chief Engineer of the Pennsylvania State Highway Department.

Robert J. Cunningham was born at Elizabeth, Pa., on April 5, 1860. His family moved to Pittsburgh in 1863 and to Sewickley in 1871. Mr. Cunningham received his education in the public schools and in Dickson's and Donthett's Academies.

ROBERT J. CUNNINGHAM,
State Highway Commissioner of Pennsylvania.

At 16 years of age Mr. Cunningham became a pilot between Pittsburgh and Louisville on river boats owned by his father, who was engaged in the coal business. Upon his father's death in 1878 he left this work and entered the newspaper business as shipping clerk on the Pittsburgh "Times," now the "Gazette-Times." In 1881 he took charge of the press rooms and machinery department of the Pittsburgh "Leader," later becoming a special writer and musical critic for the Sunday edition of that paper.

Mr. Cunningham was elected Comptroller of Allegheny County, as an independent Republican, in the fall of 1902. He served in that capacity until 1906, when he was elected to the State Senate, from which he resigned in 1908. In that same year he was reelected Comptroller and served continuously until he resigned in April of this year to accept the appointment as State Highway Commissioner. Besides serving as Comptroller of Alllegheny County and as State Senator, Mr. Cunningham was twice elected Chairman of the Republican Committee of Allegheny County.

Mr. Cunningham is a member of the Methodist Episcopal Church of Sewickley, Pa., which he joined in 1875. He was married in 1890 to Miss Edith Gilmore. He is a member of the Masons and the Elks, and of the Duquesne, Edgeworth, Americus and the Young Men's Republican Tariff Clubs. He was president of the latter organization for two years. He is a director of the First National Bank of Sewickley.

William D. Uhler was born at Nazareth, Pa., in 1872. From 1890 to 1895 he was connected with the Engineering Department of the Lehigh Valley Railroad Co. and from 1895 to 1903 was employed by the Queen Anne's Railroad Co. In this position he served in the various capacities of Assistant Engineer, Assistant General Manager and Chief Engineer.

Mr. Uhler entered road work in 1904, when he went to Caroline County, Maryland, as Roads Engineer, in which capacity he served until 1908. In that year he left Caroline County to become Engineer in Charge of Maintenance of the Maryland State Roads Commission.

On April 8, 1912, Mr. Uhler was appointed Principal Assistant Engineer of the Bureau of Highways and Street Cleaning of Philadelphia, Pa. He remained in this position until April 6 of this year, when he was appointed Chief Engineer of the Pennsylvania State Highway Department.

WILLIAM D. UHLER,
Chief Engineer, Pennsylvania State Highway Department.

Mr. Uhler is a member of the American Society of Civil Engineers, the American Road Builders' Association, the Engineers' Club of Philadelphia and the Engineers' Club of Baltimore.

The Authorities of Van Nuys, Cal., have awarded a contract for the paving of streets to R. H. McCray & Co. for $70,000.

The Board of Public Service of St. Louis, Mo., has authorized alternate bids for asphalt and bitulithic pavement on Florissant Ave. The estimated cost of the work is $93,000.

The Common Council of Beloit, Wis., has ordered paving on 24 streets, the material to be asphalt, asphaltic concrete and brick. Reference to the preparation of plans for this work was made in "Good Roads" for Jan. 16.

The Observance of Good Roads Day in the State of Utah

In response to the proclamation of Governor William Spry, Wednesday, April 28, was observed as "good roads day" in Utah, the citizens turning out in large numbers to work on the roads.

The voluntary workers in each county were under the general direction of the county road superintendents; and the various commercial organizations throughout the state rendered valuable aid in furnishing means of transportation from cities and towns to road jobs in the neighborhood, and in fostering enthusiasm in the project. The Rotary Club of Salt Lake City offered a silver loving cup to the organization turning out the largest number of members.

In addition to the work of the clubs, a number of manufacturers and commercial firms did all in their power to aid the movement. Among these were the J. I. Case Co., which tendered the use of a road grader and a traction engine, and the Richmond Machinery Co., which volunteered drilling machines. Several contractors supplied picks and shovels.

Governor Spry was with the party working under the auspices of the Salt Lake Commercial Club, which repaired about 15 miles of the so-called Lincoln Highway west of Salt Lake. The illustration at the top of the page shows the Governor and others engaged in this work.

Although no figures on the exact amount of work accomplished are available at this time, reports from various parts of the state all agree that "good roads day" was a success and it is reported that efforts are being made by a number of individuals and organizations to have another day set apart for road work. According to present plans, this would be designated for some time next fall.

Utah has planned a great deal of road building and repair work for the present season. It is estimated by the State Road Engineer, according to a recent report, that the sum of at least $1,000,000 will be spent during the year of 1915.

The work to be done on the state roads, according to present plans, includes the building of four miles of concrete highway between Salt Lake City and Ogden, another stretch of approximately the same length from Salt Lake City toward Provo, 40 miles of earth road in Millard County, 15 miles of inter-county road between Logan and Garden City, 40 miles of earth road in Iron County and a continuation of the 40 miles of highway recently completed in Beaver County.

GOVERNOR SPRY (THIRD FROM THE RIGHT) AND OTHER PROMINENT MEN AT WORK NEAR SALT LAKE CITY, UTAH, ON "GOOD ROADS DAY."

Aside from the above work on state roads, the towns and counties have planned a large amount of repair work, much of which is under way at present.

The Voters of St. James Parish, Louisiana, have endorsed a proposal to build 56 miles of gravel roads.

The Province of Andalusia, Spain, is improving several highways, among them the 19-mile stretch from Seville to Villamanrique.

Consul General George E. Anderson at Hongkong, China, reports that the government is continuing its policy of widening the old chair and ricksha roads to accommodate light automobile traffic. American asphalt and crude oil are being used in the work.

GROUP OF WORKERS NEAR SALT LAKE CITY, UTAH—LUNCH HOUR, "GOOD ROADS DAY," APRIL 28, 1915.

AMERICAN ROAD BUILDERS' ASSOCIATION

150 NASSAU STREET
NEW YORK, N. Y.

President
GEO. W. TILLSON, Brooklyn, N. Y.

First Vice President
A. W. DEAN, Boston, Mass.

Second Vice President
A. B. FLETCHER, Sacramento, Cal.

Third Vice President
(Office to be filled.)

Secretary
E. L. POWERS, New York, N. Y.

Treasurer
W. W. CROSBY, Baltimore, Md.

Through the courtesy of the publisher of "Good Roads," this page, each month, is devoted to the use of the American Road Builders' Association. It is solely in the interests of the Association, and it is the desire of the Executive Committee that all members feel that this space is their own, and that they contribute freely to it, not only as regards anything concerning the Association itself, but also that which will further the good roads movement. Besides the official announcements of the Association, there will appear on the page contributions by members, items of news concerning the Association activities and personal notes about its members. All contributions should be sent to the headquarters of the Association at 150 Nassau Street, New York, N. Y.

Executive Committee:
Nelson P. Lewis
A. W. Dean
E. L. Powers

A. R. B. A. Members to Take Part in the Pan-American Road Congress

The following A. R. B. A. members are among those who will be asked to present papers or open discussions at the Pan-American Road Congress at Oakland, Cal., next September:

Arthur W. Dean, Chief Engineer, Massachusetts Highway Commission; Charles J. Bennett, State Highway Commissioner of Connecticut; Nelson P. Lewis, Chief Engineer, Board of Estimate and Apportionment, New York City; Col. Edwin A. Stevens, State Commissioner of Public Roads of New Jersey; William D. Uhler, Chief Engineer, Pennsylvania State Highway Department; William H. Connell, Chief, Bureau of Highways and Street Cleaning, Philadelphia, Pa.; S. E. Bradt, Secretary, Illinois State Highway Commission; W. E. Atkinson, State Highway Engineer of Louisiana; W. S. Keller, State Highway Engineer of Alabama; Austin B. Fletcher, State Highway Engineer of California; Frank F. Rogers, State Highway Commissioner of Michigan; Dr. Joseph Hyde Pratt, Secretary, North Carolina State Highway Commission; A. N. Johnson, Road Engineer, Bureau of Municipal Research, New York, N. Y; George W. Cooley, State Engineer of Minnesota; W. S. Gearhart, State Engineer of Kansas; Lamar Cobb, State Engineer of Arizona.

New Members

During the past few weeks the following have been elected Active Members of the Association:

L. Amundson, County Highway Commission, Wood County, Plover St., Grand Rapids, Wis.

Wm. H. Callaway, Engineer in Charge of Paving Construction for City, Box 629, Corpus Christi, Tex.

B. E. Dodge, Assistant Bridge Engineer, Wisconsin Highway Commission, 116 East Dayton St., Madison, Wis.

J. E. Gillespie, Division Engineer, Wisconsin Highway Commission, Wood County National Bank Bldg., Grand Rapids, Wis.

J. D. Groves, Assistant Engineer, Board of Water Supply, City of New York, Prattsville, Greene County, N. Y.

Charles H. Henrick, Contractor and Engineer, City Hall, Oswego, N. Y.

John T. Hopkins, Assistant City Engineer, Oswego, N. Y.

Theodore H. Lasley, President, Southern Paving Construction Co., 711 James Bldg., Chattanooga, Tenn.

Alfred M. Lund, Civil Engineer, 527 Southern Trust Bldg., Little Rock, Ark.

Frederick O. X. McLoughlin, Civil Engineer and Surveyor and Instructor in Surveying, The College of the City of New York, New York, N. Y.

F. F. Mengel, Assistant Division Engineer, Wisconsin Highway Commission, Wood County National Bank Bldg., Grand Rapids, Wis.

Members Selected as Lecturers at Columbia University

Among the non-resident lecturers at Columbia University for next year are the following A. R. B. A. members:

Charles J. Bennett, State Highway Commissioners of Connecticut; Will P. Blair, Secretary, National Paving Brick Manufacturers' Association; Sumner R. Church, Manager, Research Department Barrett Mfg. Co.; Frederick A. Cleveland, Director, Bureau of Municipal Research, New York City; William H. Connell, Chief, Bureau of Highways and Street Cleaning, Philadelphia, Pa.; Major W. W. Crosby, Chief Engineer, Maryland Geological and Economic Survey, and Consulting Engineer; Charles Henry Davis, President, National Highways Association; Lewis R. Ferguson, Assistant Secretary, Association of American Portland Cement Manufacturers; Walter H. Fulweiler, Chief Chemist, United Gas Improvement Co.; Nelson P. Lewis, Chief Engineer, Board of Estimate and Apportionment, New York City; H. B. Pullar, General Manager, Pioneer Asphalt Co.; Philip P. Shaples, Manager, General Tarvia Department, Barrett Mfg. Co.; Francis P. Smith, Chemical and Consulting Paving Engineer; George W. Tillson, Consulting Engineer to the President of the Borough of Brooklyn, New York, N. Y.; George C. Warren, President, Warren Brothers Co.

A. R. B. A. Notes

H. N. Beck, formerly City Engineer of Muskegon, Mich., has been appointed City Manager of Grand Haven, Mich.

President George W. Tillson addressed the Chamber of Commerce, Syracuse, N. Y., on "The Financing, Selection and Construction of City Pavements" on April 26.

S. R. Church, Manager, Research Department, Barrett Mfg. Co., New York, N. Y., is scheduled to present a paper with J. M. Weiss on "Some Experiments on Technical Bitumens" at the eighteenth annual meeting of the American Society for Testing Materials, which will be held at Atlantic City, N. J., June 22-26.

John Wilson has resigned as City Engineer of Duluth, Minn., to re-enter private practice. He has opened offices at 300 First National Bank Bldg., Duluth.

J. C. Dufresne, Mem. Can. Soc. C. E., of the firm of Dufresne & Barton, Civil Engineers and Land Surveyors, Penticton, B. C., has accepted a commission in the Canadian expeditionary forces. The office of Dufresne & Barton has been closed.

Nelson P. Lewis, Chief Engineer of the Board of Estimate and Apportionment of New York City, is to make an address at the Seventh National Conference on City Planning, which opens in Detroit, Mich., June 7. Mr. Lewis is the Vice-President of the conference.

LETTER TO THE EDITOR

Organization of a State Highway Department

Editor, "Good Roads:"

I was very interested in Commissioner Carlisle's paper on the "Organization of a State Highway Department," and the discussion thereon.

It is very important to get the organization right and adapted for the work that it has to do, otherwise there is much waste of money and energy.

In America there have been more experiments in one-man government in the municipal sphere than in Great Britain. These experiments have met with a considerable measure of success, and they are worth pursuing. One-man government, like all other forms of government, has its strong and its weak points. The problem is to strike the balance between the good and the bad and to determine whether, under given conditions, it is the best form of government to adopt.

In the discussion three forms of organization were considered. Each had its advocates. I have endeavored to summarize the strong and weak points of each of these forms, the strong points being indicated by a plus sign and the weak ones by a minus sign:

(1) ONE WHOLE-TIME COMMISSIONER (PAID):

+ Rapidity of decision and action;
+ Continuity of policy;
+ Clear and undivided responsibility;

− Difficulty of finding a man qualified by experience and temperament to exercise power uncontrolled;
− Absence of all checks if a wrong man is appointed;
− Lack of public confidence due to the instinctive opposition in democratic countries to autocratic power, however wisely exercised;
− Expert advisers tempted to tender not the best advice, but the most acceptable;
− Nepotism and favoritism in making appointments.

(2) THREE WHOLE-TIME, EXPERT COMMISSIONERS (PAID):

+ Sound judgments by reason of the wider knowledge secured by the pooling of experience of three qualified men meeting as equals;
+ The fads and bias of each individual commissioner checked by the other two;
+ Public confidence;
+ Protection of the staff against favoritism;

− Internal friction leading to decisions which arouse the least opposition rather than to right ones;
− Divided responsibility;
− The strongest man may sway the other two and shelter from the consequences behind them.

(3) AMATEUR (PART-TIME) COMMISSIONERS OR ELECTED AUTHORITY (UNPAID):

+ Control of public expenditure by a body directly representing the taxpayer;
+ Limitation of the paid expert whose zeal may induce him to spend public money on his own department without regard to the requirements of other public services;
+ Education of the representatives of the community and through them of the community itself as to the needs of the particular service;

− Control of the man who knows by the man who does not;
− Subordination of the needs of the service administered to political considerations;
− Unpaid offices attract busybodies who make mischief; failures who are obstructive and destructive; and old men with reputations who have outlived their usefulness.

I will not attempt to say with which form the balance of advantage lies. As a matter of fact I have no opinion in the abstract, because a decision as to which form of government should be adopted should be determined by the peculiar characteristics of the people living in the area with which it is proposed to deal. An organization which might suit Lancashire might not work in Florida, and something quite different might be necessary in Madras. But the statesman should have a clear knowledge based on past experience of the workings of different forms of state organization. For government is an experimental science.

W. REES JEFFREYS,
Secretary, British Road Board,
General Secretary Third International Road Congress.

London, England.

[The foregoing letter refers to the paper by former State Highway Commissioner John N. Carlisle of New York State, which was presented by Commissioner Carlisle at the eleventh annual convention of the American Road Builders' Association at Chicago in December of last year. The paper was printed in "Good Roads" for February 6, 1915. Mr. Jeffreys has made a special study of the organization of administrative bodies having to do with highway work and read papers on the subject at the International Congresses in Paris in 1908, and in London in 1913. He visited America in the summer of 1912, and was entertained by the American Road Builders' Association at a dinner at the Hotel Astor, New York City.]

NEW PUBLICATIONS

MAINTENANCE OF INDIANA HIGHWAYS, by George E. Martin, C.E., Assistant Professor of Highway Engineering, School of Civil Engineering, Purdue University, Lafayette, Ind.; Highway Bulletin No. 1 of Purdue University. Paper; 6x8½ ins., 24 pp.; illustrated.

This booklet is a brief treatise on the maintenance of roads, prepared with especial reference to conditions in the state of Indiana. The treatment of the general subject is divided into sections dealing with earth roads, gravel roads, macadam roads, tar macadam roads and concrete roads. The illustrations comprise an organization chart, cross sections of roadways and drainage structures, and working plans for the building of a horse-drawn concrete roller and a plank road drag.

THE MUNICIPAL ENGINEERS JOURNAL, Volume I, No. 1, May, 1915; Published by the Municipal Engineers of the City of New York, 29 West 39th St., New York, N. Y. Paper; 6x9 ins., 123 pp.; illustrated; insets.

This publication, which is the first number of a journal which will be published monthly, except in July and August, by the Municipal Engineers of the City of New York, contains considerable matter of interest to highway engineers, besides committee reports, notices and other matter of interest especially to members of the organization. Included in the contents is a paper entitled "Some Problems of Street Paving in Large Cities," by H. W. Durham, former Chief Engineer of Highways of the Borough of Manhattan, and a paper entitled "The City Controlling the Development of Private Property" by George B. Ford, Consultant to the Committee on the City Plan of the New York City Board of Estimate and Apportionment. The journal is of a convenient size, is well printed on a good grade of paper and is illustrated by excellent halftones and line cuts.

REPORTS

MILWAUKEE COUNTY, WIS.; Third Annual Report of County Highway Commissioner H. J. Kuelling to the County Board of Supervisors. Paper; 6x in., 111 pp.; illustrated.

This report covers work done up to January 1, 1915, and contains a number of charts and tables showing progress of work and comparative costs. It is illustrated with halftone reproductions of photographs showing road work in various stages and contains a frontispiece with the portraits of the members of the Joint Committee on Highways, Bridges and Railroads and Laws, Legislation and Rules.

GENERAL ASPHALT COMPANY; Twelfth Annual Report to the Stockholders, Fiscal Year Ending April 30, 1915. Paper; 6x9 ins., 39 pp.; illustrated.

This report includes a general review of the company's operations during the year and several financial statements showing the details of the company's business. Considerable space is given roads and streets, a portion of the report containing, besides a resume of the company's operations in this field, discussions of the policies of municipalities relative to open and closed specifications and of the educational work carried on by the company. The report also includes a detailed description of operations for petroleum in Trinidad and in Venezuela. In addition, considerable space is given to the maintenance of pavements under guarantee. The illustrations consist of excellent halftones of scenes at the company's plants and views of the asphalt lakes from which the company's product is obtained.

INDIANAPOLIS, INDIANA, BOARD OF PARK COMMISSIONERS; Twentieth Annual Report, for the Fiscal Year Ending December 31, 1914. Paper; 6x9 ins., 84 pp.; illustrated; insets.

This report contains a list of the Park Commissioners from the organization of the Department of Parks in 1895 to the present; a list of the present officers of the department, and the reports of the Commissioners, the Landscape Architect, the Executive Officer and the Accountant, together with tabular data on the work of the department during the year covered by the report. The illustrations consist of halftones showing road and other scenes in the parks. There are four insets—one a topographical map of Garfield Park, another a similar map of Rhodius Park, another a table showing the distribution of maintenance costs, and the fourth a study for the treatment of University Square. The report is especially well printed and illustrated and is a very attractive publication.

STREET PAVING AND MAINTENANCE IN EUROPEAN CITIES; Report by Henry Welles Durham, Chief Engineer of the Bureau of Highways, Borough of Manhattan, New York City, to the President of the Borough of Manhattan. Cloth; 7x10 in., 437 pp.; illustrated; insets.

This volume consists of a report by Henry Welles Durham, Chief Engineer of the Bureau of Highways, Borough of Manhattan, New York City, under the administration of the late Mayor Gaynor. Mr. Durham represented the City of New York at the Third International Road Congress at London, England, in 1913 and afterward made a tour of the large cities of Great Britain and Central Europe for the purpose of studying European methods of paving and maintenance. The report is the result of his observations and contains much valuable information. It is divided into eight chapters, six of which are descriptive of conditions and methods in Great Britain, France, Germany, Austria, Italy, Belgium, Holland and Switzerland. The other two chapters are entitled "General Observations" and "Some Ideas About European Cities Contrasted with the Camera Record of the Facts." There are 17 appendices in which are included maps, statistics, notes and reports. The volume is profusely illustrated by reproductions of photographs showing streets in various cities and by maps and charts, a number of the latter being printed as insets.

ALABAMA ASSOCIATION OF HIGHWAY ENGINEERS, Constitution and Annual Proceedings, 1914-1915. Paper; 5½ x8½ ins., 50 pp.

Included in this report are lists of members, minutes of meetings, papers presented and the constitution of the association. Among the papers are the following: "Roads in the Philippines," by W. A. Crossland, C. E., formerly of the Philippine Bureau of Public Works; "Surfacing Clay-Gravel Roads with Asphaltic Oils," by Fay McClure, County Engineer of Mobile County, Alabama, and "The Necessity of Study After Graduation," by J. B. Converse, City Engineer, Selma, Ala.

COMMISSIONER OF PUBLIC ROADS, STATE OF NEW JERSEY; Twenty-first Annual Report. Cloth; 6x9 ins., 107 pp.; illustrated.

This is a report by Col. Edwin A. Stevens, Commissioner of Public Roads of the State of New Jersey, and covers the fiscal year ending October 31, 1914. It contains, among other information, detailed statements of all road and bridge construction, together with the cost of such improvements; the character and cost of repairs to roads and bridges, a financial statement and the report of the State Highway Engineer. There are two appendices, one showing the form of contract for state aid bridges and the other containing a number of comparative tables. The report contains numerous half-tone illustrations showing various features of road work in different parts of the state.

BOOK NOTICE

THE ECONOMICS OF CONTRACTING, VOLUME II, by Daniel J. Hauer, Editor, "The Contractor." Cloth, 8vo., 334 pp.; illustrated. E. H. Baumgartner, Rand McNally Bldg., Chicago, Ill. $2.50.

In this book the author has covered much the same ground as was covered in Volume I, issued some time ago, but considerable matter has been added and some subjects treated in the former volume have been taken up in a somewhat different manner in the new work. The book, while devoted to contracting in general, contains, of course, much that is applicable to highway contracting. The chapter headings are as follows: Estimating and Bidding Upon Contracts; Making Contracts and Obtaining Bonds; The Financial End of Contracting; Preventing Lawsuits and Legal Aspects of Contracts; Planning Construction Jobs; Handling and Training Men; Office Filing Systems; Organization of a Construction Company; Lines of Contracting and Specialization; The Standing of Contractors.

NEWS NOTES

The Geneva County, Alabama, Good Roads Association was recently formed. Officers were elected as follows: President, W. H. Morris; Vice-President, J. W. Draughon; Secretary, E. M. Tilton; Treasurer, James Johnson, Jr.

The California State Highway Commission has agreed to sell $250,000 highway bonds to Placer County for the construction of a concrete lateral between Auburn and Roseville, a distance of 15.6 miles. The sale is in consideration of an agreement by the county to build a $13,000 bridge over the Bear River.

The Voters of Kings County, Cal., have voted in favor of the project to issue bonds to the amount of $672,500 for the construction of 108 miles of permanent highways connecting all cities and community centers with the county seat and joining the Hanford-Visalia lateral of the state highway at several points.

COMING MEETINGS

June 7-8.—Ozark Trails Association.—Annual Convention, Independence, Kan.

June 7-9—National Conference on City Planning.—Conference, Detroit, Mich. Secretary, Flavel Shurtleff, 19 Congress Street, Boston, Mass.

June 22-25—Society for the Promotion of Engineering Education—Annual meeting. Iowa State College, Ames, Ia. Secretary, F. S. Bishop, University of Pittsburgh, Pittsburgh, Pa.

June 22-26—American Society for Testing Materials.—Annual meeting, Atlantic City, N. J. Secretary, Edgar Marburg, University of Pennsylvania, Philadelphia, Pa.

June 25-July 1.—The County Councils Association (Great Britain).—National Road Conference and Exhibition, London, England. Organizing Secretary, G. Montagu Harris, Secretary of the County Councils Association; Business Manager, A. F. May, 13 Victoria Street, Westminster, S. W., London, England.

August 4-5—Texas Good Roads Assocition and County Judges' and Commissioners' Association—Mid-Summer Meeting, Agricultural and Mechanical College of Texas, College Station, Tex. Secy., Texas Good Roads Association, D. E. Colp, San Antonio.

Sept. 13.—Tri-State Roads Association.—Third annual convention, San Francisco, Cal. Executive Secy., Geo. E. Boos, 1220 Flood Bldg., San Francisco, Cal. (Meeting to be merged with the Pan-American Road Congress.)

September 13-17—American Road Builders' Association and American Highway Association.—Pan American Road Congress, Oakland, Cal. Secretary, American Road Builders' Association, E. L. Powers, 150 Nassau St., New York, N. Y. Executive Secretary, American Highway Association, I. S. Pennybacker, Colorado Bldg, Washington, D. C.

October 4-7—Northwestern Road Congress—Annual meeting, Cedar Rapids, Ia. Secy.-Treas., J. P. Keenan, Sentinel Bldg., Milwaukee, Wis.

October 11-15—National Paving Brick Manufacturers' Association—Annual convention, Dayton, O. Secretary, Will P. Blair, B. of L. E. Bldg., Cleveland, O.

October 11-15—American Society of Municipal Improvements—Annual convention. Dayton, O. Secretary, Charles Carroll Brown, 702 Wulsin Building, Indianapolis, Ind.

November 17-19—National Municipal League—Annual convention. Dayton, O. Secretary, Clinton Rogers Woodruff, 705 North American Building, Philadelphia, Pa.

Arrangements for the Pan-American Road Congress

As was noted in "Good Roads" for May 29, the Executive Committee of the Pan-American Road Congress has been advised by the officials of the Tri-State Good Roads Association that they have decided to change the date of the Pacific Coast Good Roads Congress from the week of August 2 to that of September 13—the date of the Pan-American Road Congress. This means the practical merging of the meetings of the Tri-State Good Roads Association with the Pan-American Road Congress.

The Executive Committee held a meeting in New York on Saturday, May 22, at which progress reports were made by the several sub-committees and further plans were made for the holding of the meeting at Oakland next September. It was felt by the committee that the cooperation of the Tri-State Good Roads Association would be of very great assistance in making the Pan-American Road Congress the greatest meeting of its kind ever held in the world. It is apparent that great interest in the meeting is being taken by the public, and there is every indication of the most gratifying success. Official invitations to send delegates are soon to be issued to all of the states of the Union, to the Canadian provinces and to the countries of South America.

While all the topics have not yet been assigned to speakers, the following subjects were decided upon at the last meeting of the committee: The History and Future of Highway Improvement; the Benefits and Burdens of Better Roads; The Relation of the Road to Rail and Water Transportation; The Responsibility for Road Conditions and the Way to Secure the Improvement of Road Conditions; Tree-Planting and Roadside Aesthetics; The Essentials of Proper Laws for Highway Work; Highway Indebtedness—Its Limitation and Regulation; Organization and System in Highway Work; The Educational Field for Highway Departments; System in Highway Accounting; Uniformity for Highway Statistics and Data; Engineering Supervision for Highway Work; The Merit System in Highway Work; The Determination of the Justifiable Outlay for Specific Cases of Proposed Highway Improvement; Proper Road Location—Its Importance and Effects; Road Drainage and Foundations; Highway Bridges and Structures; Roadway Surfacings; Resurfacing Old Roads; Street Pavements; Convict Labor for Highway Work; Equipment for Highway Work; Motor Traffic—Its Developments, Trend and Effects; Load and Tire Effect and Regulation; Comparisons of Traffic and Their Economic Value; Maintenance, Materials and Methods; Dust Suppression and Street Cleaning.

The National Road Conference in England

According to recent announcements regarding the National Road Conference and Exhibition at London June 25 to July 1, which was noted in "Good Roads" for May 8, the conference on the Reconstruction of Roads in Belgium, to be held on the last day of the conference, will be opened by a paper contributed by M. Henri Vandervin, Chief Engineer and Director of Roads and Bridges of Belgium.

The preliminary list of papers to be read and discussed at the Road Conference held by the Institution of Municipal and County Engineers on June 24, 25 and 26, in conjunction with the congress and exhibition arranged by the County Councils Association, includes the following: "The Improvement and Maintenance of Highways in Connection with Modern Traffic Conditions," by C. F. Gettings, County Surveyor, Worcestershire; "Improvement and Maintenance of Highways," by J. S. Brodie, M. Inst. C. E., Borough Engineer, Blackpool; "Some Recent Experiences in the Surfacing and Maintenance of Roads, Particularly on a Clay Subsoil," by J. A. Webb, Surveyor, Hendon Rural District Council; "The Use of Motor Vehicles in Haulage of Materials on the Highway," by F. W. Smart, Chief Engineering Assistant, Bedfordshire; "Mechanical Traction for Municipal Work," by E. J. Elford, Borough Surveyor, Southend-on-Sea; "Haulage by Mechanical Means vs. Horse Power," by J. Rush Dixon, M. Inst. C. E., Borough Engineer, Woolwich; "Haulage by Mechanical Means," by T. W. E. Higgens, A. M. Inst. C. E., Borough Engineer, Chelsea; "Reinforced Concrete for Roads, Sewerage, etc.," by A. E. Collins, M. Inst. C. E., City Engineer, Norwich.

A meeting of the County Superintendents of Highways of New York State will be held at the International Hotel, Niagara Falls, N. Y., on June 22-24, according to a recent report. Plans are being made by members of the Board of Supervisors and by County Superintendent of Highways Thomas M. Brennen, of Niagara County. W. A. McLean, Engineer of Highways, Province of Ontario, Canada, will be one of the speakers, it is stated.

NEW MACHINERY AND APPLIANCES

Front Drive, Bottom Dump Motor Truck

In the accompanying illustration is shown a motor truck of a new design which has recently been put on the market for road building and other purposes.

The truck is a 5-ton, 35-40 HP. machine, equipped with a four-cylinder motor of 4¼-in. bore and 6-in. stroke. The wheel base is 13 ft. 2 ins., the front tread 64 ins. and the rear tread is 65 ins., out to out of tires. The front wheels are the driving wheels and are equipped with 38x6-in. rubber tires. The rear wheels are of the Sarven type, 53 ins. high over tires, with 5x3-in. riveted rims, 3-in. spokes and 5x1-in. steel tires.

The truck has a left-hand drive with throttle on the steering wheel and the controlling levers in the center. The ignition is by Eisemann magneto with automatic spark control. The dumping and winding levers are inside the cab within easy reach of the driver.

The speed of the machine is from 10 to 14 miles per hour, and it can be turned in a 48-ft. circle, thus making it possible to turn the truck around in an ordinary 50-ft. street without backing.

The body is of the bottom dump type, built of birch, with heavy steel reinforcements. The length of the body (inside) is 8 ft., the width at the top 64 ins., the width of the body proper (inside) 40½ ins., the depth of the flaring upper box 21 ins. and of the body proper 19 ins. The clearance with the bottom down is 16 ins.

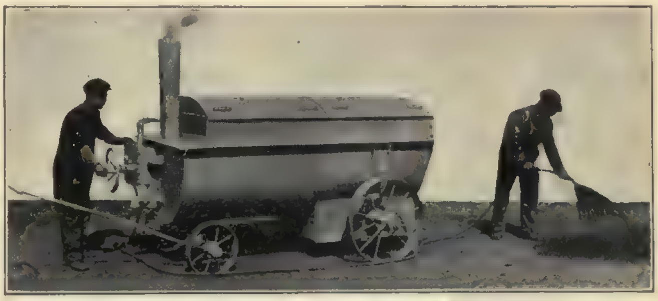
The capacity of the truck is 100 cu. ft. and its weight 8,250 lbs. When loaded, 66 per cent. of the weight is carried on the rear axle and 34 per cent. on the front axle.

Several special advantages are claimed for the truck. One of these is that the driving wheels being in front, it is not necessary to have rubber tires on the rear wheels, and that as 66 per cent. of the load is carried on these steel tires in the rear a large saving is effected in maintenance through the reduction of tire cost. Another advantage claimed for the truck is that as the load is pulled instead of pushed the power is much more efficiently applied. Among other special points are that the dumped load does not interfere with the driving wheels, that the gravity dumping device reduces operating cost and that the low center of gravity adds to the steadiness of the truck.

The truck is manufactured by the Watson Wagon Co., of Canastota, N. Y.

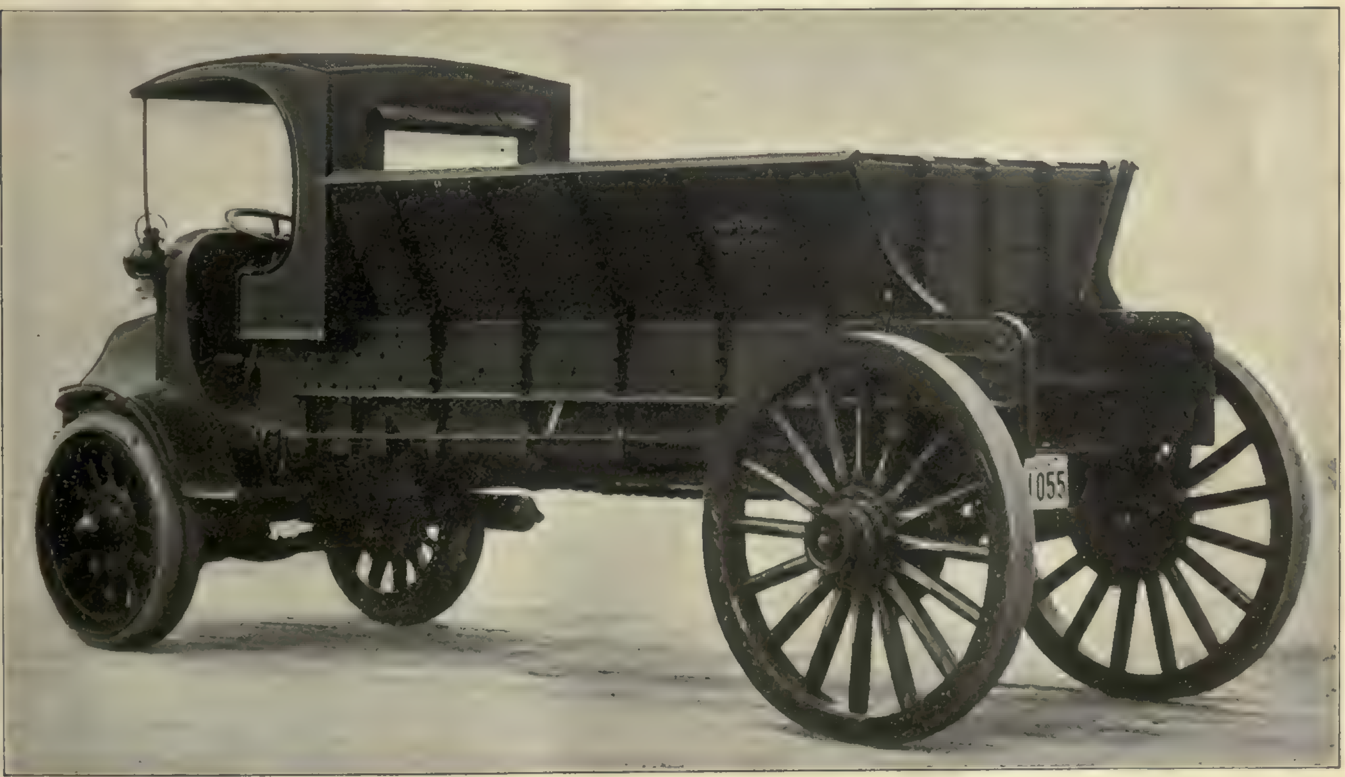
Heater for Tar and Asphalt

In the accompanying illustration is shown a new type of heater for tar and asphalt which has recently been brought out.



CONNERY TARANA ASPHALT HEATER.

The heater is made in three sizes, having capacities of 300, 400 and 500 gals. The outer shell of the heater is made of ¼-in. boiler steel with welded seams and steel reinforcement. The inside tank is made of 3/16-in. boiler steel with



WATSON FRONT DRIVE, BOTTOM DUMP MOTOR TRUCK.

welded seams. The cover is of 16-gauge steel and is made in two pieces. Both the front and rear axles are 2 ins. square. The front wheels are 18 ins. in diameter and the rear wheels 30 ins. All tires are 4½ ins. in width, the tread being 58 ins. The width of the heater, over all, is 67 ins. The 300-gal. kettle is 74 ins. long and the 400-gal. and 500-gal. kettles 98 ins. The height of the 300 and 400-gal. models is 57 ins. and of the 500-gal. model 63 ins.

The heater is equipped with a Kinney hand pump, as shown, for applying the material under pressure. The pump also serves to circulate and agitate the material in the heater to prevent overheating or coking. The spraying apparatus is equipped with a Kinney patented spraying nozzle. Attachments for hoisting barrels and for warming barrels of heavy material are furnished when especially ordered.

The heater is known as Connery's Non-Leakable Welded Tar and Asphalt Heater and is manufactured by Connery & Co., of Philadelphia, Pa.

NEWS OF THE TRADE

The Exhibit of the Barrett Mfg. Co. at the Panama-Pacific Exposition

The exhibit of the Barrett Mfg. Co. in the Mines and Metallurgy Building at the Panama-Pacific Exposition, San Francisco, Cal., is shown in the accompanying illustration.

EXHIBIT OF THE BARRETT MANUFACTURING CO. AT THE PANAMA-PACIFIC EXPOSITION, SAN FRANCISCO, CAL.

One of the features of the display is a large block of soft coal around which are grouped the various products derived from that substance. Among these is coal tar, from which Tarvia, paving pitch and oil for treating wood blocks are produced. The exhibit also includes samples of the company's various products, including those used in road building, and photographs. The attractive arrangement of the exhibit is shown by the illustration.

Granite Block Pavement in Philadelphia

The construction of improved granite block pavement with grouted joints on Germantown Avenue, Philadelphia, Pa., is just being completed. To familiarize the public with the pavement and its adaptability, signs calling attention to it have been placed at various points on Germantown Avenue and also on Market and several other streets where this pavement has been laid. The signs, which are printed on cards, are held in attractive frames with glass fronts and read as follows:

GRANITE BLOCK PAVEMENT IN PHILADELPHIA, PA.

Improved Type of
GRANITE BLOCK PAVEMENT
On Six-Inch Concrete Base,
Germantown Avenue

The construction of this pavement presents:

The latest and best practice in granite block paving work.

A type designed to withstand the extremely heavy traffic on this street.

A surface which will be smooth riding for automobiles and afford a good foothold for horses drawing heavy loads.

Foundation Course.—The pavement is laid on a 6-in. concrete base mixed in the proportions of 1 part Portland cement, 3 parts sand and 6 parts stone.

Cushion Course.—Between the concrete foundation and the block surface there is a 1-in. sand cushion.

Surface Course.—The improved granite blocks are from 8 to 12 ins. long, 3½ to 4½ ins. wide and from 5 to 5½ ins. deep, accurately dressed. The heads are so cut that they have no more than ⅜ in. depression from a straightedge laid in any direction across the head and held parallel to the general surface of the block. The joints are not more than ½ in. wide at the top and for a depth of 1 in., and not more than 1 in. wide in any other part of the joint. They are filled with a grout of Portland cement and sand in the proportion of one part of cement to one part of sand.

For further information, apply to
Chief, Bureau of Highways and Street Cleaning,
Room 232, City Hall, Philadelphia.

Rex Low Charging Mixers

In the accompanying illustration are shown twelve Rex low charging mixers ready for final inspection before shipment at the plant of the manufacturer—the Chain Belt Co., of Milwaukee, Wis.

The twelve mixers were sold in one day recently by various salesmen and agents of the company and were shipped to the following purchasers: Yackel & Fischer, Lewiston, Minn.; S. F. Perry, Decatur, Ill.; A. J. Bradner, Hatton, Ohio; Burrell Eng. & Constr. Co., Chicago, Ill.; C. H. Schenk, Springfield, Ill.; Lodi Concrete Co., Lodi, Wis.; C. W. Juby, Elgin,

SHIPMENT OF TWELVE REX LOW CHARGING MIXERS READY FOR INSPECTION AT THE FACTORY.

Ill.; A. N. Smestead, Orfordville, Wis.; Two Miracle Concrete Co., Kalispell, Mont.; City of Barre, Vt.; E. C. Humphrey, Ridgewood, N. J., and the Henry Shenk Co., Erie, Pa.

Cost Data on the Use of Dustoline

The Dustoline for Roads Co., of Summit, N. J., recently compiled figures on the cost of dust laying with five different non-asphaltic dust layers in East Orange, N. J.

According to the data secured, 860,386 sq. yds. were treated, at a total cost of $20,267.92. The total number of gallons applied was 251,302; the average amount applied per sq. yd. was .29208 gal., and the average cost per sq. yd. was 2.3557 cts. Dustoline was used on 185,343 sq. yds., the total number of gallons used being 40,956 and the total cost $3,428.92. The average cost per sq. yd. for the season was 1.85 cts., which is .5057 ct. lower than the average.

The figures cover the period from March to December, 1914, and were compiled by the Street Department of the city of East Orange, N. J.

The International Hendersonian Co., Inc., of New York City, has been incorporated under the laws of New York, to manufacture paving materials and machinery The company is capitalized at $100,000.

Bulletin B4 recently issued by the American Cement Machine Co., Inc., Keokuk, Ia., contains specifications and prices of the "Boss" paving and sidewalk mixer. Several half-tone reproductions of photographs are used to illustrate various points of the mixer.

The Link-Belt Co., Chicago, Ill., has recently issued Bulletin No. 221 describing its patented circular storage system for gravel, stone and similar materials. In addition to concise descriptive matter, the bulletin contains several half-tone and line engravings illustrating the operation of the system.

A 16-page booklet has been issued by P. Roughen, of Fond du Lac, Wis., describing the Roughen adjustable paving gauge. The publication contains three full-page half-tones showing the gauge in use on paving work, as well as several smaller illustrations showing different parts of the apparatus.

Meeting of the Directors of the Dixie Highway Association

A meeting of the directors of the Dixie Highway Association was held at Chattanooga, Tenn., May 20 to 22, for the purpose of selecting the route of the highway in accordance with the action taken by the Conference of Governors held at Chattanooga on April 3, a report of which was printed in "Good Roads" for May 1, 1915.

In order to meet with the wishes of various communities which desired to have the proposed route located so as to include them, two routes, designated as the West Route and the East Route, were finally selected.

The West Route commences at Chicago and extends southerly through Momence, Watseka, Hoopeston and Danville, Ill.; Covington, Crawfordsville, Indianapolis, Martinsville, Bloomington, Bedford and Paoli, Ind.; Louisville, West Point, Elizabethtown, Cave City, Bowling Green and Russellville, Ky.; Springfield, Nashville, Murfreesboro, Shelbyville, Sewanee, Mont Eagle and Chattanooga, Tenn.; La Fayette, Summerville, Rome, Cartersville, Atlanta, Jonesboro, Griffin, Barnesville, Macon, Americus, Albany and Thomasville, Ga.; Tallahassee, Live Oak, Lake City, Jacksonville, St. Augustine and Palm Beach to Miami, Fla.

The East Route leaves the West Route at Indianapolis, Ind., and extends through Richmond, Ind.; Dayton and Cincinnati, Ohio; Covington, Williamstown, Georgetown, Lexington, and Richmond, Ky.; Cumberland Gap, Knoxville, Rockwood, Dayton and Chattanooga, Tenn.; Dalton, Calhoun, Atlanta, McDonough, Jackson and Macon, Ga. The route from this point to Jacksonville is to be selected later.

After the meeting of the directors for the selection of the route, a meeting of the incorporators was held, at which a charter under the laws of Tennessee was adopted and a permanent organization completed. Officers were elected as follows: President, C. E. James, Chattanooga, Tenn.; Vice Presidents, M. M. Allison, Tennessee; Harry L. Gordon, Ohio; Thomas Taggart, Indiana; W. T. Anderson, Georgia; G. W. Saxon, Florida; H. B. Hanger, Kentucky; Secretary-Treasurer, William R. Long, Chattanooga, Tenn.; Field Secretary, W. S. Gilbreath, Indianapolis, Ind.; Executive Committee: President James and Secretary Long, of Chattanooga, Tenn.; Carl G. Fisher, Indianapolis, Ind.; Richard Hardy, Chattanooga, Tenn., and Clark Howell, Atlanta, Ga.

PERSONAL NOTES

John Sorenson has been appointed City Engineer of El Paso, Tex.

Carl C. Widener has been reelected City Engineer of Bozeman, Mont.

John D. Furlong has been elected Superintendent of Streets of Wilmington, N. C.

R. J. Windrow has been reappointed County Engineer of McLennan County, Texas.

C. M. King, of Sandusky, O., has been elected County Engineer of Erie County, Ohio.

W. W. Johnstone has been appointed County Highway Engineer of Etowah County, Ala.

W. F. Downing has been appointed County Road Inspector of Jessamine County, Ky.

Col. Samuel D. Lehr, who served for 30 years as City Engineer of Allentown, Pa., died recently at his home in that city.

George Cromwell has been appointed City Engineer of San Diego, Cal., by the new city administration, succeeding W. M. Rumsey.

John A. Goetz has been appointed City Engineer of Mattoon, Ill., vice C. L. James, who has been appointed Superintendent of Waterworks.

E. F. Ayres has been appointed resident engineer of the Oregon State Highway Commission at Sherwood, Ore., where he will have charge of the Rex-Tigardville section of the Capitol Highway, comprising about 6 miles in Washington County.

The County Commissioners of Luzerne County, Pennsylvania, are considering the erection of a $175,000 bridge at Wapwallopen, Pa.

The Department of Parks and Boulevards of Detroit, Michigan, has awarded to the Detroit Department of Public Works a contract for 140,000 sq. yds. of paving at $1.13 per sq. yd.

Colfax, Wash., and the Surrounding Country observed May 20 as "good roads day" under the auspices of the Colfax Commercial Club.

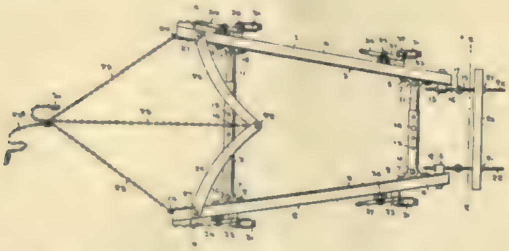
The State Highway Commission of California has awarded contracts for the construction of 29 miles of highway in Contra Costa, Sonoma and Monterey Counties at a total cost of $191,008.70.

The County Commissioners of Kings County, Washington, have decided to include in all road contracts a stipulation that none but citizens of the United States shall be employed on county road work.

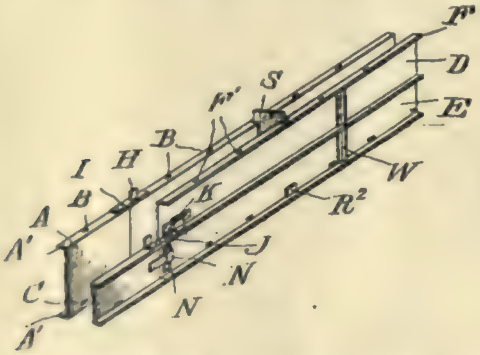
RECENT PATENTS

The following list contains the numbers of the principal patents relating to roads and pavements and to machinery used in their construction or maintenance which have recently been issued, together with the names and addresses of the patentees, dates of filing, serial numbers, etc. In some cases the principal drawing has also been reproduced. Printed copies of patents listed may be obtained for 5 cts. each by application to the Commissioner of Patents, Patent Office, Washington, D. C.

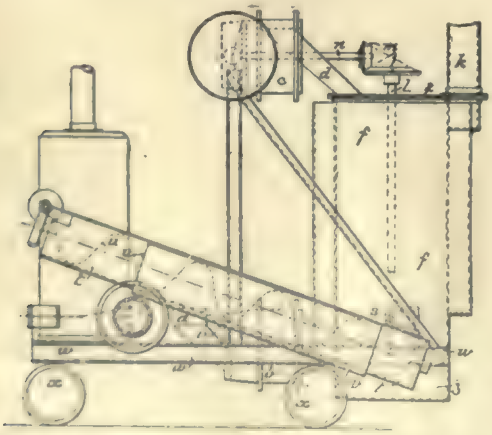
.1,138,489. APPARATUS FOR APPLYING OIL TO ROAD SURFACES. Henry G. Knief, Napa, Cal. Filed Nov. 28, 1913. Serial No. 803,487. (Cl. 137-64.)



1,138,735. ROAD DRAG. Harvey Morris Davis, Kinmundy, Ill. Filed July 3, 1914. Serial No. 848,824. (Cl. 37-5.)



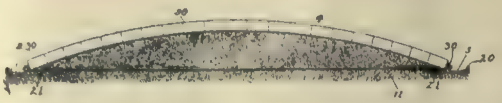
1,138,740. FORM FOR MAKING CURBS. Franklin W. Eschen, New York, N. Y. Filed July 13, 1914. Serial No. 850,726. (Cl. 25-118.)



1,138,906. PLANT FOR MAKING TAR MACADAM. Neil Taylor, Leeds, England. Filed Feb. 16, 1914. Serial No. 818,935. (Cl. 94-6.)

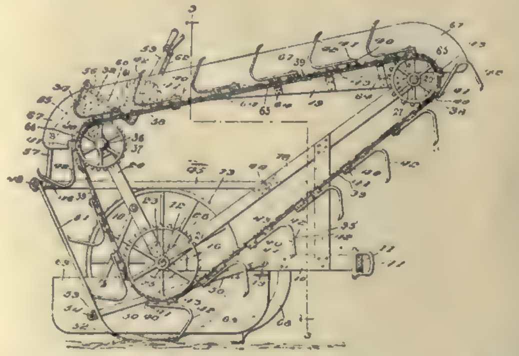
1,139,945. DUMPING WAGON. Thomas Wright, Jersey City, N. J. Filed Dec. 17, 1912. Serial No. 737,300. (Cl. 21-20.)

1,140,213. DUMPING WAGON. James Thompson, Greeley, Colo. Filed Aug. 21, 1914. Serial No. 857,870. (Cl. 21-86.)



1,138,983. ROAD. Robert P. Scott, Cadiz, Ohio. Filed April 19, 1913. Serial No. 762,191. (Cl. 94-1.)

1,139,032. STONE GATHERING MACHINE. Edward C. Heimke, Macfarland, Wis. Filed May 2, 1914. Serial No. 835,802. (Cl. 55-17.)

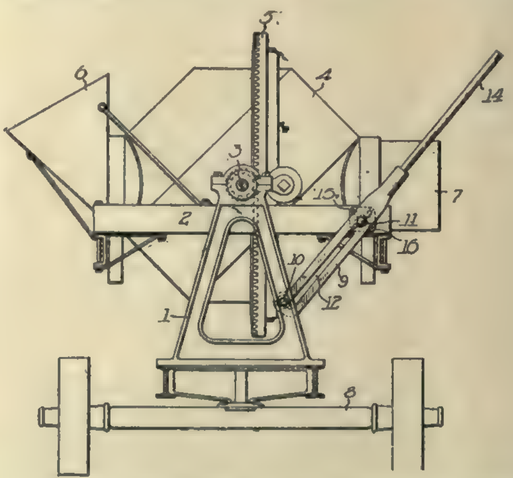


1,139,168. STONE RAKER AND LOADER. Clifford E. Culp and Allen T. Wilks, Stella, Mo. Filed June 27, 1914. Serial No. 847,672. (Cl. 55-17.)

1,139,802. SIGN POST. John H. Ridenour, Muskogee, Okla. Filed Sept. 17, 1914. Serial No. 862,220. (Cl. 40-145.)

1,140,362. SHEET METAL CULVERT. John H. Dean, Birmingham, Ala. Filed Sept. 22, 1913. Serial No. 791,078. (Cl. 61-9.)

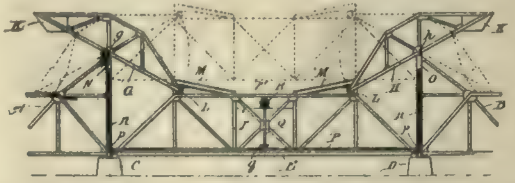
1,140,776. CONCRETE FORM FOR CURBS, WALKS, ETC. Alvin R. Teters, Boise, Idaho. Filed Feb. 6, 1914. Serial No. 816,980. (Cl. 25-118.)



1,140,298. ACTUATING MEANS FOR DUMPING CONCRETE MIXERS. John M. Bruns, Waterloo, Ia., assignor to Waterloo Cement Machinery Corporation, Waterloo, Ia. Filed Feb. 14, 1910. Serial No. 543,865. (Cl. 74-5.)

1,140,984. DRAWBRIDGE. Henry Arthur Icke, Victoria, British Columbia, Canada. Filed July 15, 1914. Serial No. 851,066. (Cl. 14-31.)

1,140,985. ROAD LEVELING MACHINE. Charles H. Jones, Galva, Ill. Filed Jan. 13, 1914. Serial No. 811,882. (Cl. 37-7.)



1,140,316. VERTICAL LIFT BRIDGE. Theodor Rall, Chicago, Ill. Filed May 19, 1913. Serial No. 768,551. (Cl. 14-42.)

24

GOOD ROADS

A Weekly Journal of Road and Street Engineering and Contracting

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Copy for advertisements of which proofs are to be submitted to advertisers should reach the New York office as follows: For insertion in the first issue of the month, by the fifteenth of the preceding month; for other issues, by noon on Thursday of the week before date of issue.

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Movement to Secure State Highway Money for New York City

State Senator R. F. Wagner, of New York, has introduced a proposed amendment to the constitution to permit New York City to receive a share of the money paid for state highways.

Senator Wagner stated that last year New York City contributed $13,000,000 as its share of the $18,000,000 state highway fund and received nothing in return. The amendment provides that New York City shall receive a pro rata share of the state funds for each of the five counties situated within its limits. On the basis of last year's highway fund, this would amount to $1,650,000.

Cincinnati, Ohio, Adopts New Plan for Street Assessments

The City Council of Cincinnati, O., has adopted a new plan for street assessments which, it is believed, will save the city approximately $100,000 a year. The new system provides that no motion for the improvement of a street nor preliminary estimate of cost shall be made until a petition, signed by an owner of abutting property, shall have been filed. The other property owners will then be given a hearing and, if objection is made, the improvement will not be carried out.

Before a contract for an improvement is made, the property owners must make a first payment which will be based upon an estimate of the cost ascertained by experts. Bonds will then be issued for the remainder of the assessments.

Under the plan formerly in use, assessments were not levied until an improvement was completed and the total cost ascertained. This led to many lawsuits on the plea that property owners were not consulted regarding the improvement.

The new plan does not apply to downtown streets where improvements are made on the front-foot plan, nor to main traffic arteries where an improvement becomes a benefit to the entire city.

The State of Pennsylvania Observes Good Roads Day

The State Highway Department of Pennsylvania has announced that 76,996 men and 13,500 teams worked on approximately 6,000 miles of roads on May 26, which was observed as "good roads day" throughout the state.

Although rain interfered with the work in many parts of the state, especially in Monroe and Pike Counties, where, owing to the inclement weather, no effort was made to do any road work, the results attained were extremely satisfactory.

Governor Brumbaugh has issued a statement thanking the people for their efforts and requesting each person to report any highway defects to the proper authorities, in order that the roads of the state may be kept up to a uniform standard of excellence. The Governor is said to be of the opinion that "good roads day" should occur more frequently than once a year and it is understood that another day will be designated immediately after the harvest.

The State Highway Department has assumed control of 77 new routes, which add approximately 1,000 miles to the state's system of main roads.

The State of Missouri Will Have Two Good Roads Days

The State of Missouri will observe June 15 and 16 as "good roads days."

The matter has been taken up by the State Highway Department and State Highway Commissioner Frank W. Buffum has written to every county judge, county road commissioner and road overseer in the state, as well as to mayors, commercial clubs, managers of moving picture houses and others, asking them to do all in their power to make the project a success.

State Highway Commissioner Cowen of Ohio Reappointed

Clinton Cowen, State Highway Commissioner of Ohio, has been reappointed by Governor Frank B. Willis for a term of four years.

Commissioner Cowen was originally appointed to succeed James R. Marker, as noted in "Good Roads" for March 20, and assumed office on April 1. His present term expires on June 16.

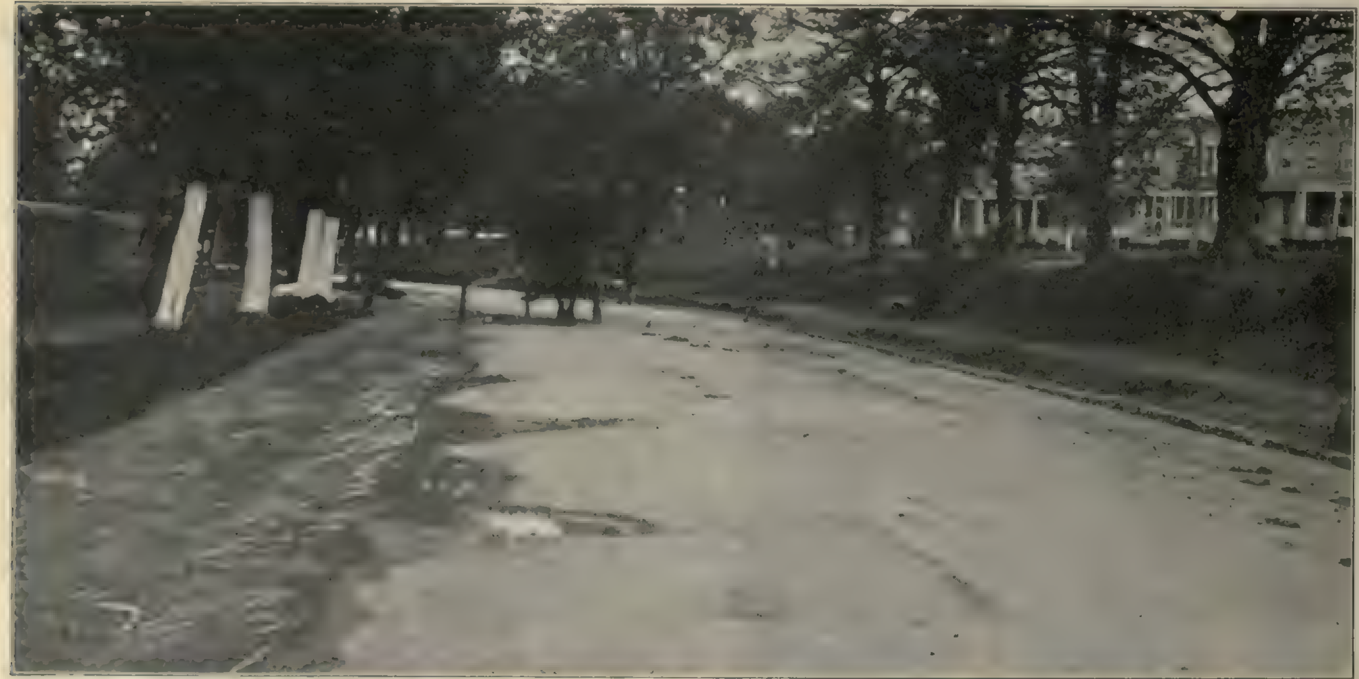
Topeka Pavement in Queens Borough, New York, After Two and One-Half Years

By **FREDERIC A. REIMER**[*]

What has been termed "Topeka" pavement received considerable attention about four years ago through a dispute in Topeka, Kan., when the Warren Brothers Company, because of infringement on its patent, enjoined the specifications of a contract, which had been let for asphaltic concrete pavement. The specifications were then radically changed, the resultant mixture having less than 10 per cent. of material coarser than sand passing ¼-in. screen, and more than 90 per cent. finer than ¼ in. in size.

The modified specifications, as adopted in Topeka, and as used in Queens Borough, were as follows:

Asphaltic cement from 7 to 11 per cent.; mineral aggregate passing 200-mesh screen, 5 to 11 per cent.; mineral aggregate passing 40-mesh screen, 18 to 30 per cent.; mineral aggregate passing 10-mesh screen, 25 to 55 per cent.; mineral aggregate passing 4-mesh screen, 8 to 22 per cent.; mineral aggregate passing 2-mesh screen, under 10 per cent.; sieves to be used in the order named.



SHELL ROAD, ELMHURST AVE., NEAR BAYLISS ST., BOROUGH OF QUEENS, NEW YORK, N. Y.—ASPHALTIC CONCRETE, TOPEKA SPECIFICATIONS, LAID IN 1912.

In the several miles of pavement laid under these specifications in Queens Borough nearly every brand of asphalt was used, so that a very broad test of this type of pavement has been secured. Any pavement built on the basis of legal compromise, rather than upon experience, raises in the mind of the engineer grave doubt as to its ultimate efficiency, and it is readily seen from the above specifications that, with the exception of a very small percentage of trap rock, these specifications give practically a sheet asphalt mixture, with the further exception that one of the most important essentials of sheet asphalt pavement, that is, the binder course, is omitted.

Mr. Clifford Richardson, in writing of "Topeka," states: "Experts agree that the binder course is essential to asphalt paving construction, and it is equally important in connection with the so-called 'Topeka' specifications."

In substantiation of this statement I do not find any eminent expert opinion contrary to this criticism. Notwithstanding the doubt which has been thrown upon this class of construction by road engineering experts, promoters and contractors desirous of laying this class of pavement have succeeded in securing the laying of a considerable yardage of it, and, owing to the comparative cheapness of this type of material in relation to other standard bituminous pavements, many people have used it as an argument in favor of cheapness in paving materials. But the writer believes that cost is only one item of consideration in the determination of the character of pavement to be adopted. Full consideration should be given to what the test of time and travel will do to any new form of construction, and entire reliance should not be placed upon theoretical judgment, much less to prejudice, on account of low cost.

Were it true, in face of adverse theoretical criticism, that this type of pavement produces a road surface cheaper and equally as durable as standard mixtures, no engineer, considering his obligations to the office he holds, should be so narrow as not to give it full consideration in his recommendations to the people he serves.

Essex County, New Jersey, of which the writer is County Engineer, has never used any of this type of pavement, believing that it was an experiment and preferring to let others make the experiment. New Jersey has admitted this type of pavement in its state specifications, but to date very little has been used in the state, and that has been down for such a short period of time that no experience of value can be gained from this source. Small sections have been laid in the town of Bloomfield and in the city of Passaic and, in the writer's opinion, have not proven satisfactory.

The writer, being familiar with the contracts which were let in Queens Borough in 1911 and 1912, believed that this would give a splendid opportunity to watch the results as the basis for proper test of the stability and durability of this type of pavement and that it would be wise for engineers to wait a considerable time to see whether or not this

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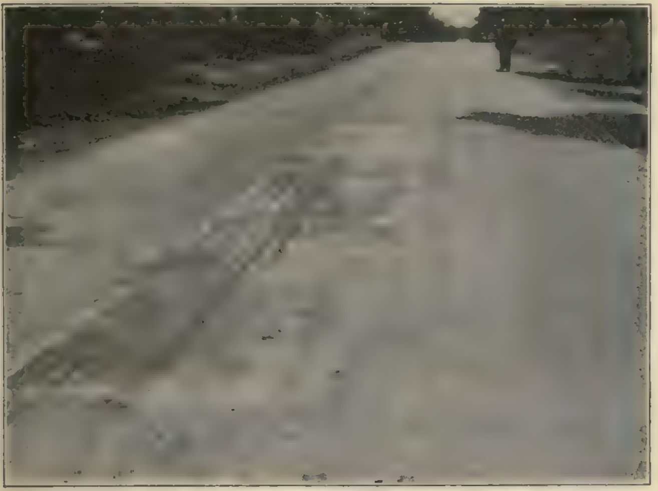
[*] County Engineer of Essex County, New Jersey.



WHITESTONE AVE., BOROUGH OF QUEENS, PAVED IN 1912 WITH "TOPEKA."

METROPOLITAN AVE., BOROUGH OF QUEENS, RESURFACING UNDER WAY.

pavement would be successful. At the present time there is a very considerable demand for this type of pavement in the state of New Jersey. This is largely due, however, to political influence, which is never a safe phase of advice or influence for an engineer to consider in making his recommendations. The arguments used usually deal in generalities, but particularly where cheapness is the main argument it strikes a responsive chord in the public ear, and it is largely due to these conditions that the writer was prompted to make a thorough examination of this "Topeka" pavement which had been laid in Queens Borough. This inspection was made May 19, 1915, with the following conclusions:

(1) Thompson Avenue and Hoffman Boulevard, which were laid in 1912, were first examined, and both of these roads are evidently subjected to very considerable automobile and motor truck traffic. While the pavement on these two streets appears to be standing up very well in places, a large proportion of it shows that the pavement is creeping and shifting very badly on the foundation, which bears out, I believe, Mr. Richardson's contention that one of the chief dangers surrounding this class of construction lies in the omission of the binder course.

It would be hard for anyone who is a student of bituminous mixtures and pavements to believe that, at least for a large portion of this pavement, the life would be more than another year, which would make a total of three and one-half to four years for these two roads.

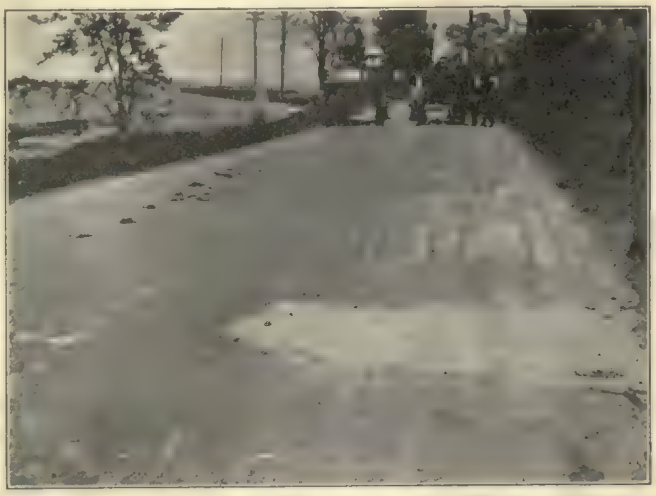
(2) The writer then examined what is known as Shell Road, laid, I believe, in 1911, resurfaced in 1913, and extensively repaired since 1913. Portions of this highway appeared to be in good condition, but the greater portion was in a very deplorable state, to the extent of being dangerous to ride over. There were many large and bad holes along the sides and through the center of the pavement. The pavement had crept and shifted more than in the first roads examined.

(3) Examination was then made of Whitestone Avenue, laid, I believe, in 1912. This pavement appears to be in fairly good condition, but there was unmistakable evidence that a large amount of repairs had been made recently, both in the center and on the edges of the road. There were also numerous disintegrations at the time of examination which had apparently developed subsequent to recent repairs.

(4) The next road examination was Willetts Point Road. A repair gang was at work on this road at the time of the investigation, repairs being principally on the edges of the road, but in many cases disintegrations extended to the center of the road. The edges of this road are lined with brick for the protection of the edges of the pavement; but, in spite of this precaution, the pavement continually breaks down on the inside of the brick shoulders. There were many cracks in the pavement, which extended in some cases nearly across the entire width, indicating that the road would rapidly deteriorate at these points.

(5) Broadway was visited next. There were evidences that this road had been extensively repaired, and, while pleasant to ride over, it still showed numerous disintegra-

WILLETTS POINT ROAD, BOROUGH OF QUEENS, PAVED WITH "TOPEKA" IN 1912.



WILLETTS POINT ROAD, BOROUGH OF QUEENS, "TOPEKA" MIXTURE, LAID IN 1912.

tions, which, I believe, give every indication of repairing being necessary at an early date.

(6) The examination of Metropolitan Avenue showed that practically the entire road has had to be resurfaced, and the use of "Topeka" pavement on this road has been the most disastrous of any of the streets laid in Queens Borough, with the possible exception of Shell Road. The work of resurfacing and repairing was in progress when this examination was made, as is shown in one of the accompanying illustrations. The entire old surface, while only two and one-half years old, has had to be removed and replaced by a new surface.

Other roads examined were 18th Street, 11th Avenue, 14th Street, Bell Avenue and also several roads in Far Rockaway, Flushing and Jamaica, some of which, though rough, were in fairly good condition. But the majority of them needed what might be fairly termed—after such a short period—very extensive repairs. On some of these roads there was scarcely any traffic and still there were evidences of extensive and rapid disintegration at many points.

The experience obtained, therefore, by the writer in this investigation prompts him to state that the only attribute which this type of construction seems to obtain, is the element of cheapness; and no matter how loudly this element may be pressed by clamor from interested promoters, the writer is satisfied with his recommendation to his county, urging that it hold to a conservative course and permit others to experiment with "Topeka" pavement.

The very thorough trial in Queens Borough, New York, during the past three and one-half years has gone a long way towards proving that this course was the wise one.

PERSONAL NOTES

George A. Reed, formerly City Engineer of Barre, Vt., has been appointed City Engineer of Burlington, Vt.

Edward A. Jones of Scranton, Pa., has resigned as Second Deputy State Highway Commissioner of Pennsylvania.

Leon Briggs of Joplin, Mo., has been appointed City Engineer of Webb City, Mo., succeeding F. A. Martin.

Robert Nesch, President of the Pittsburg, Kan., Paving Brick Co., died recently at his home in Kansas City, Mo.

Dr. Stephen Taber, Professor of Geology at the University of South Carolina, has been reappointed State Geologist.

Charles R. Brown of Vicksburg, Mich., has been elected Chairman of the Kalamazoo County Board of Road Commissioners.

D. S. Struthers, Assistant City Engineer of Wilmington, N. C., has been appointed Acting City Engineer succeeding F. F. Pillet.

Frank Lee has been appointed City Engineer of Barre, Vt., to succeed George A. Reed whose appointment to another post is noted in this column.

Frederick E. Everett has been appointed Acting State Highway Commissioner of New Hampshire in charge of the newly established State Highway Department.

Howard W. Holmes has been appointed Assistant State Engineer of Oregon. Previous to his appointment, Mr. Holmes was in charge of grade crossing elimination plans in Portland, Ore.

Poul Lindholm, Engineer of Highways, Copenhagen, Denmark, has been awarded the Traveling Fellowship of the American-Scandinavian Foundation for 1915-1916. He will devote the year to graduate work in highway engineering at Columbia University, New York City.

Charles E. James has resigned as President of the Dixie Highway Association. In his letter to the Dixie Highway Commissioners Mr. James states that he does not approve of the selection of more than one route and that he will devote his time to building a short line through Tennessee and Kentucky to the Ohio River, to Cincinnati or Louisville, or both.

George H. Biles, Engineer of Maintenance of the Pennsylvania State Highway Department, has been promoted to the position of Second Deputy State Highway Commissioner to fill the vacancy caused by the resignation of Edward A. Jones, noted eleswhere in this column. Mr. Biles will continue in charge of the Maintenance Division and no appointment will be made to fill the vacancy caused by his promotion.

MEETINGS

Conference of Mayors of New York State

The sixth annual Conference of Mayors and Other City Officials of New York State was held at Troy, N. Y., on Tuesday, Wednesday and Thursday, June 1, 2 and 3.

At the opening session, Mayor Rosslyn M. Cox, of Middletown, spoke on "Efficiency First—The Slogan of the Conference," in course of which he reviewed the work of the Conference during the past year.

The first session on Wednesday was unique in that it took the form of a breakfast conference at the Hotel Renssalaer. The chief interest of this session centered in five-minute replies to the interrogation: "What Have Been Your Important Municipal Accomplishments During the Past Year?" This was supplemented at the afternoon session by answers to the question: "What is the Next Most Important Problem Your City Must Solve?"

Numerous addresses were made at the various sessions, among the speakers being Nelson P. Lewis, Chief Engineer of the Board of Estimate and Apportionment, New York City, who spoke on "City Streets and How to Pay for Them," and Arnold W. Brunner, Chairman of the Committee on City Planning, whose subject was "City Planning in New York State Cities."

The following officers were elected: President, Mayor Rosslyn M. Cox, of Middletown, reelected; Vice-president, Mayor Edwin W. Fiske, of Mount Vernon; Treasurer, Mayor John A. Stephens, of Albany. William P. Capes, of New York City, remains as Secretary. A Bureau Council was chosen consisting of Mayors James Lennon, of Yonkers, Frank Lybolt, of Port Jervis, D. W. Wilbur, of Poughkeepsie, Frank Nelson, of Hornell and C. W. Brister, of Auburn.

Committees were appointed to prepare a home rule amendment to the state constitution and to cooperate with the State Comptroller in formulating a system of municipal accounting.

Massachusetts State Highway Association

The spring meeting of the Massachusetts State Highway Association was held at the Hotel Kimball, Springfield, Mass., on June 2 and 3, in conjunction with the meeting of the Connecticut Highway Officials' Association and the Mayors' Club of Massachusetts.

The meeting opened with a dinner at which Frederick J. Hillman was toastmaster. Before the speeches, a short business session was held with President Frederick H. Clark, Superintendent of Streets and Engineering, of Springfield, in the chair. Seven new members were elected and President Clark announced that the August meeting would be held at Worcester, Mass.

Following the business session, speeches were made by Mayor Frank E. Stacy of Springfield, who welcomed the visitors, Arthur L. Linscott, President of the Mayors' Club of Massachusetts; Charles J. Bennett, State Highway Commissioner of Connecticut; James W. Synan of the Massachusetts Highway Commission; Irving W. Patterson, Engineer of the State Board of Public Roads of Rhode Island; C. M. Brooks, Division Engineer of the New Hampshire Highway Commission; John A. Schuerle, General Secretary of the Hampden County Improvement League, and President Clark.

On Junt 3 the members of the association were taken on an automobile tour of the city in the morning, and the afternoon was spent in inspecting streets in course of construction.

Texas Good Roads and Drainage Congress

A Good Roads and Drainage Congress was held at Houston, Tex., June 3 and 4, under the auspices of the Progressive League of Houston. The meeting was attended by delegates from 73 counties of South and East Texas.

The first session was called to order by County Judge W. H. Ward of Harris County, after which an address of welcome was delivered by Mayor Campbell of Houston. The following papers were read: "Drainage, Flood Prevention and Good Roads—Advantages of Enlarged Districts or Community Coordination and Cooperation," by Clarence Ousley, Director of Extension, Texas Agricultural and Mechanical College, and "Some Engineering Phases of Good Roads Undertakings—Class of Construction, First Cost and Indispensable Unkeep," by R. L. Morrison, Professor of Highway Engineering, Texas Agricultural and Mechanical College. A number of brief talks concerning local problems were given by several county and district engineers.

At the session on June 4, Lieutenant Governor W. P. Hobby presided. Col. J. H. Hawley of Galveston, spoke on "How to Finance Good Roads," and William Bradburn, Consulting Engineer of the National Good Roads Association, spoke on "Good Roads Essentials."

A permanent organization known as the South and East Texas Development League was formed at this session and resolutions were adopted recommending inter-county road building and maintenance. John T. Scott, President of the First National Bank of Houston, was elected President and one vice-president was named from each county represented. An executive committee consisting of one member from each of seven cities was elected.

National Conference on City Planning

The Seventh National Conference on City Planning was held at the Hotel Statler, Detroit, Mich., on Monday, Tuesday and Wednesday of this week.

At the first session which was held at 8 p. m. on Monday, an address was made by Nelson P. Lewis, Chief Engineer of the Board of Estimate and Apportionment, New York City, and Vice-President of the Conference. Flavel Shurtleff, Secretary of the Conference, read a report entitled "Six Years of City Planning in the United States" and Edward H. Bennett, Consultant to the City Plan Commission of Detroit, read a paper entitled "The City Plan of Detroit."

The second and third sessions held at 10 a. m. and 2.30 p. m. on Tuesday, were devoted to the reports of committees and to a discussion of land subdivision. The fourth session at 8 p. m. on Tuesday was devoted to the subject of city planning and civic design.

The topics "Constitution and Powers of a City Planning Authority" and "European Planning Administration" were considered at the fifth and sixth sessions on Wednesday.

Those attending the conference were entertained at luncheon on Monday and a banquet was held on Wednesday evening.

COMING MEETINGS

June 22-25—Society for the Promotion of Engineering Education—Annual meeting. Iowa State College, Ames, Ia. Secretary, F. S. Bishop, University of Pittsburgh, Pittsburgh, Pa.

June 22-26—American Society for Testing Materials.—Annual meeting, Atlantic City, N. J. Secretary, Edgar Marburg, University of Pennsylvania, Philadelphia, Pa.

June 25-July 1.—The County Councils Association (Great Britain).—National Road Conference and Exhibition, London, England. Organizing Secretary, G. Montagu Harris, Secretary of the County Councils Association; Business Manager, A. F. May, 13 Victoria Street, Westminster, S. W., London, England.

July 14-16—North Carolina Good Roads Association—Annual meeting, Asheville, N. C. Secretary, Joseph Hyde Pratt, Chapel Hill, N. C.

August 4-5—Texas Good Roads Assocition and County Judges' and Commissioners' Association—Mid-Summer Meeting, Agricultural and Mechanical College of Texas, College Station, Tex. Secy., Texas Good Roads Association, D. E. Colp, San Antonio.

Sept. 13.—Tri-State Roads Association.—Third annual convention, San Francisco, Cal. Executive Secy., Geo. E. Boos, 1220 Flood Bldg., San Francisco, Cal. (Meeting to be merged with the Pan-American Road Congress.)

September 13-17—American Road Builders' Association and American Highway Association.—Pan American Road Congress, Oakland, Cal. Secretary, American Road Builders' Association, E. L. Powers, 150 Nassau St., New York, N. Y. Executive Secretary, American Highway Association, I. S. Pennybacker, Colorado Bldg, Washington, D. C.

October 4-7—Northwestern Road Congress—Annual meeting, Cedar Rapids, Ia. Secy.-Treas., J. P. Keenan, Sentinel Bldg., Milwaukee, Wis.

October 11-15—National Paving Brick Manufacturers' Association—Annual convention, Dayton, O. Secretary, Will P. Blair, B. of L. E. Bldg., Cleveland, O.

October 11-15—American Society of Municipal Improvements—Annual convention. Dayton, O. Secretary, Charles Carroll Brown, 702 Wulsin Building, Indianapolis, Ind.

November 17-19—National Municipal League—Annual convention. Dayton, O. Secretary, Clinton Rogers Woodruff, 705 North American Building, Philadelphia, Pa.

North Carolina Good Roads Association

The annual meeting of the North Carolina Good Roads Association will be held at Asheville, N. C., on July 14, 15 and 16.

Among the subjects considered will be "The Maintenance of North Carolina Roads" and "The Relation of the Good Roads Association to the State Highway Commission." Inasmuch as the State Highway Commission was created at the 1915 General Assembly, this promises to be a subject of great interest.

Governor Locke Craig will attend the meeting as Chairman of the State Highway Commission.

Special Train to the Pan-American Road Congress

At a meeting of the Executive Committee of the Pan-American Road Congress held in New York, N. Y., on Monday of this week, it was decided to run a special train to accommodate delegates to the meeting at Oakland, Cal., during the week of September 13. The lines over which the "Pan-American Road Congress Special" will be run have not been selected, but it is planned to so arrange the train that delegates may have the benefit of one of the best of the scenic routes to the Exposition. The Executive Committee has received many letters from municipalities and organizations inviting delegates to stop and make local inspection tours, and it is probable that some of these will be accepted, as it is felt that such trips would prove both interesting and instructive. Further details of the arangements made for the train will be announced later.

The Executive Committee also decided at the meeting to appoint local representatives or chairmen in all of the principal cities in the United States and Canada in order to carry on the work with maximum efficiency. Each local representative will look after the interests of delegates from his section, give the congress the greatest amount of publicity possible and aid in arousing interest in it.

Among the papers to be presented at the coming semi-annual meeting of the Society of Automobile Engineers is one on "Road Tractors" by Frank H. Trego. There will also be a statement of progress from the Truck Standards Division by William P. Kennedy, Chairman of the Division. The meeting is to be held June 14-17 during a cruise from Detroit through Lake Huron and Georgian Bay.

The Lake Huron Shore Good Roads Association and the West Michigan Pike Association will meet at Mackinaw Island, Mich., on July 23, in conjunction with the following organizations: Northwestern Michigan Development Bureau, Western Michigan Development Bureau, Detroit Chamber of Commerce, Saginaw Board of Trade, Bay City Chamber of Commerce and Grand Rapids Association of Commerce.

NEWS OF THE TRADE

The Butt Joint Nestable Culvert Co., has been organized at Dallas, Tex., with a capital of $75,000.

The Walter A. Zelnicker Co., St. Louis, Mo., has issued a new price list of tanks and car tanks, locomotives, cars, journal boxes and kindred articles.

The Marion-Osgood Co., manufacturer of steam shovels, dipper dredges, ballast unloaders and kindred machinery, has opened a new office at 807 Globe Building, Minneapolis, Minn., in charge of William H Klingel.

The Trailer Department of the Troy Wagon Works Co., Troy, O., has issued "Book Two," designed to show how the efficiency of the average motor truck has been increased by the use of Troy trailers. The booklet contains 20 pages and is profusely illustrated with half-tones and wash drawings.

The Whitelaw Bros. Chemical Co., St. Louis, Mo., has organized a new department in order to represent the interests of the Rocmac Road Corporation of America in the territory west of the Mississippi. G. M. Curry, formerly of the Engineering Department of the Pennsylvania Railroad, at St. Louis, has been placed in charge.

The Knox Motors Associates, distributors of the products of the Knox Motors Co., Springfield, Mass., have issued a 16-page catalogue descriptive of the Knox Tractor. The catalogue is well printed on fine paper and, in addition to descriptive matter, contains numerous half-tone and line engravings. A half-tone reproduction of the plant of the Knox Motors Co., forms the frontispiece.

Catalog No. 107, describing the Studebaker gravity road oiler, has been issued by the Studebaker Corporation, South Bend, Ind. Although composed of only eight pages, the catalogue is remarkably complete. It is illustrated with half-tone reproductions of various types of Studebaker gravity road oilers and contains a complete list of prices of oilers and extra attachments.

The Austin Manufacturing Co., Chicago, Ill., has issued a new catalogue descriptive of its line of modern earth handling machinery. The book contains 108 pages. It is profusely illustrated with half-tone reproductions of the New Era grader, dump wagons, road machines, portable rock crushers, plows, dump cars and other machines and devices of interest to road builders.

NEWS NOTES

The Paving Program of Washington, D. C., for 1916 includes considerable asphalt paving and carries a total appropriation of about $155,000.

Cayuga County, N. Y., will observe June 23 as "good roads day." The work will be done under the direction of the Cayuga County Farm Bureau.

The Fairmount District of Marion County, West Virginia, will hold a special election June 21 on the question of issuing $100,000 in bonds for road improvement.

The Kane County, Ill., Good Roads Association has awarded first, second and third prizes to 74 high and grade school pupils in a good roads essay contest.

San Diego, California, will consolidate the offices of City Engineer, Harbor Engineer and Hydraulic Engineer in one department, according to a recent report.

The City Council of Harrisburg, Pa., is considering the submission to a vote of the people of a $300,000 loan for a viaduct to connect two sections of the city.

Governor Hiram Johnson of California has signed the bill providing for a referendum vote on the project to issue $15,000,000 of state highway bonds, as noted in "Good Roads" for May 22.

Voters of Kanawha County, W. Va., have voted in favor of a $375,000 road bond issue. Contracts for the work were let some time ago, contingent upon the ratification of the bond issue.

The State Highway Commission of Maine has awarded the contract for a section of state highway between Portland and Dunstan, to the Hassam Paving Co., of Worcester, Mass., on its bid of $69,454.36.

The City Council of St. Paul, Minn., has awarded a contract for 110,000 sq. yds. of 3½-in. wood blocks to the Republic Creosoting Co., of Indianapolis, Ind. The company's bid was $1.34½ per sq. yd.

The Good Roads Association of the Seaboard Magisterial District, Princess Anne County, Va., was formed recently at Oceana, Va. R. H. Gordon was elected President and L. D. Lindsay Secretary.

Director Cooke of the Department of Public Works, Philadelphia, Pa., has awarded a contract for paving South Street, between 2nd and 27th Streets, with wood block to the McNichol Paving & Construction Co., of Philadelphia. The estimated cost of the work is $110,000.

The National Highway Protective Association reports the number of fatalities in New York City during the month of May, due to automobiles, as 30. Of these 14 were children under 16 years of age. Trolley cars caused the death of 5 persons and wagons of 11, 10 of whom were children. During the corresponding month of 1914, motor vehicles killed 14 persons, trolley cars, 2, and wagons, 11. In New York State, outside of New York City, automobiles killed 24 persons during May, 4 were killed by trolley cars and 2 by wagons. In the State of New Jersey, 14 persons were killed by automobiles, 1 by trolley car and 2 by wagons during May. Of these fatalities, 7 occurred at highway grade crossings in New York State and 3 in New Jersey. The Association states that hereafter the monthly report of deaths due to automobiles will include those caused by motorcycles, 16 persons having been killed by them in New York State since the first of the year, as against 2 during the corresponding period of 1914.

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Notice to discontinue subscription should be sent to the New York office.

Copy for advertisements of which proofs are to be submitted to advertisers should reach the New York office as follows: For insertion in the first issue of the month, by the fifteenth of the preceding month; for other issues, by noon on Thursday of the week before date of issue.

Copy for all advertisements of which proofs need not be submitted—including "Proposal," "For Sale," "Want" and other classified advertisements—will be accepted until noon on Thursday of the week of issue.

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State Officials of Missouri Do Two Days' Work on Roads

As noted in the previous issue of "Good Roads" June 15 and 16 were observed as "good roads days" throughout the State of Missouri.

Practically all of the state officials worked on the roads, a party of 25 convicts being headed by Governor Major and Champ Clark, Speaker of the House of Representatives.

A great deal of work was accomplished during the two days. The project was warmly supported by the State Highway Department and Frank W. Buffum, State Highway Commissioner, did much preliminary work which contributed largely to the success of the movement.

Florida State Road Department to Consist of Five Members

An act recently passed by the Florida Legislature and signed by Governor Park Trammell, provides for the creation of a State Road Department consisting of five members.

The members of the department are to be appointed by the Governor, one from each Congressional District of the state and one from the state at large. The term of office is four years, but, as is usual in such cases, the first appointees will hold office for one, two, three and four years. The members will receive no compensation, but will be allowed expenses.

The department will have control of all roads and bridges now under the jurisdiction of county commissions and will exercise a general supervision, through a state road commissioner, to be appointed, of the acts of the various county commissions.

For the maintenance of the department, the act sets aside 15 per cent. of the motor license fees. The provisions of the act become operative on October 1.

It is understood that F. O. Miller and Capt. W. J. Hillman, respectively President and Honorary President of the Florida State Good Roads Association, will be members of the department and that J. P. Clarkson, Secretary of the Association, will be Chief Clerk.

Judge Allison Elected President of Dixie Highway Association

A meeting of the directors of the Dixie Highway Association was held at Chattanooga, Tenn., on Tuesday of this week.

Judge M. M. Allison of Chattanooga, one of the vice presidents, was elected President of the Association to fill the vacancy caused by the resignation of Charles E. James, noted in the last issue of "Good Roads."

C. H. Huston of Chattanooga, was chosen to succeed Judge Allison as vice president, and A. R. Sanford of Knoxville, Tenn., was selected to fill the vacancy on the Board of Directors.

Kansas City, Missouri, to Issue Bonds for $4,500,000

At a recent election in Kansas City, Mo., the voters approved 19 bond proposals, carrying a total of $4,500,000 which will be used for public improvements.

Of this amount, approximately $2,170,000 will be devoted to street improvements, bridges and viaducts. The items of this character are as follows:

Sixth St., traffic way, $450,000; bridges and viaducts, $450,000; traffic approach to the Union Station, $700,000; traffic approaches to 12th St. viaduct, $200,000; 23d St. traffic way, $300,000; Chestnut Ave. traffic way, $25,000; 23d St. subway under Robert Gillham Road, $15,000; widening New Brook St., $30,000.

Pennsylvania State Highway Department Inaugurates a New System

The State Highway Department of Pennsylvania has inaugurated a new system which, it is planned, will enable the county superintendents of highways to keep a closer watch on the work being done in their respective districts and will, at the same time, effect a saving of more than $40,000.

To this end 80 general foremen, who worked for eight months in the year and whose aggregate salaries and expenses amounted to $8,000 a month, have been dismissed. The county superintendents will be provided with motor runabouts which will enable them to cover the ground formerly looked after by the general foremen.

Ten of these runabouts have been ordered and it is expected ultimately to place 50 in service. At the contract price, this number will cost $23,250 which, subtracted from the $64,000 saved in salaries and expenses of general foremen, will leave a balance of $40,750 in favor of the State Highway Department.

The runabouts will be equipped with wagonette bodies for the purpose of carrying tools. Chief Engineer Uhler figures that the saving in the traveling expenses of county superintendents will more than pay for the operating and maintenance of the vehicles.

State Aid Road Work in New Jersey

During the fiscal year of 1913-1914 the total expenditure of state funds for road work in New Jersey amounted to $1,237,996.45, according to the annual report of Commissioner of Public Roads E. A. Stevens, which is noted elsewhere in this issue. Of this total expenditure, $558,026.85 was expended from public road funds, and the balance, $679,969.60 was expended from motor vehicle funds.

The expenditure from the public road funds was paid from the appropriations of 1910, 1911, 1913 and 1914, the amounts from these various appropriations being as follows: 1910 appropriation, $35,938.33; 1911 appropriation, $5,108.20; 1913 appropriation, $307,239.58; 1914 appropriation, $209,740.74. The mileage of roads involved in the work covered by this expenditure was 102.046. The payments on work in the various counties made from these four appropriations are shown in Table 1.

TABLE I—PAYMENTS FROM THE PUBLIC ROAD FUNDS FOR WORK IN NEW JERSEY COUNTIES DURING THE FISCAL YEAR OF 1913-14

County	Payments			
	From 1910 Appropriation	From 1911 Appropriation	From 1913 Appropriation	From 1914 Appropriation
Atlantic	$	$	$ 11,319.80	$ 1,528.35
Bergen	....	....	35,409.96	....
Burlington	....	....	8,545.37	12,684.92
Camden	....	....	59,587.36	....
Cape May	....	....	41,928.98	....
Cumberland	....	....	7,729.91	....
Essex	7,020.45	....	10,109.32	....
Gloucester	....	....	....	....
Hudson	....	....	....	....
Hunterdon	....	589.84	51,285.55	13,224.32
Mercer	....	....	....	....
Middlesex	7,945.61	4,053.50	2,884.35	7,660.22
Monmouth	....	....	....	5,000.83
Morris	....	....	....	....
Ocean	....	....	25,836.74	6,593.59
Passaic	....	....	45,900.74	34,334.29
Salem	....	....	5,152.57	15,288.40
Somerset	....	....	....	....
Sussex	20,972.27	....	....	2,299.32
Union	....	....	....	29,458.46
Warren	....	464.86	1,498.28	21,053.90
Total	$35,938.33	$5,108.20	$307,188.93	$149,126.60
	General Inspection (not chargeable to any special road)...		50.65	60,614.14
			$307,239.58	$209,740.74

The total expenditure from the public road funds was divided as shown in Table II. The details of the expenditures from the motor vehicle funds are shown in Table III.

TABLE II—DETAILS OF EXPENDITURES FROM PUBLIC ROAD FUNDS IN NEW JERSEY DURING THE FISCAL YEAR OF 1913-14

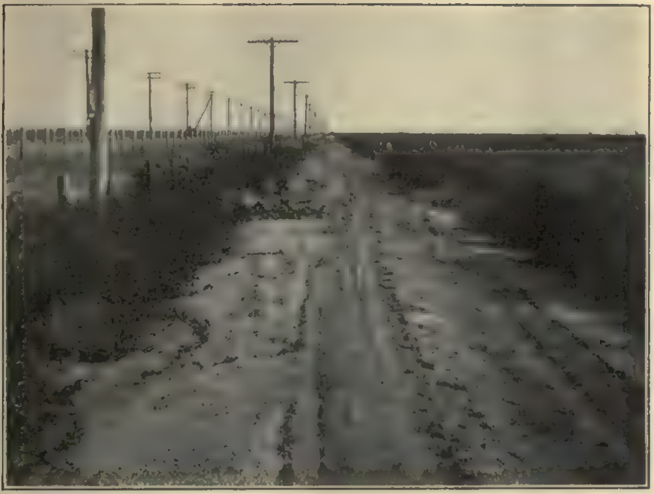
Paid on Contracts		$442,863.41
Paid on Extras		34,184.02
Paid for Engineering (final)		13,706.04
Paid for Inspection (final)		6,659.24
		$497,412.71
Paid in advance for Inspection on 40% roads		17,455.63
Paid for Inspection on 33⅓% roads		699.00
Paid for Inspection not charged to roads:		
Salary Regular Inspector	$6,453.80	
Expenses Regular Inspector	1,570.26	
Salary Foremen	11,302.65	
Salary Extra Inspector	7,266.00	
		26,592.71
Survey State Highway		15,866.80
Total paid during year		$558,026.85

TABLE III—DETAILS OF EXPENDITURES FROM MOTOR VEHICLE FUNDS IN NEW JERSEY DURING THE FISCAL YEAR OF 1913-14

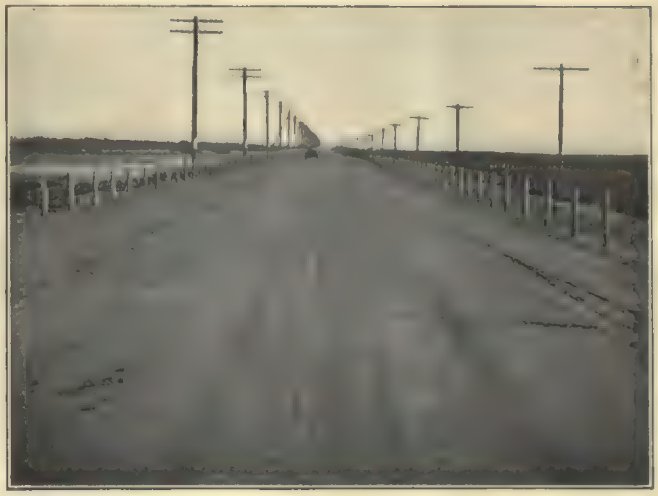
Paid on Allotments for maintenance work		$590,226.28
Appropriated for Salary Assistant Supervisors (lapsed to State Treasury)		3,000.00
Paid for Expenses Assistant Supervisors.	$2,976.43	
Lapsed to State Treasury	23.57	
		3,000.00
Appropriated for Expenses of Motor Vehicle Department		83,743.32
Total paid from Motor Vehicle Funds		$679,969.60

In addition to the work covered by the appropriations listed in the foregoing, there was, at the time of the report, a considerable mileage of roads approaching completion which is not listed in Table I. These roads had a total length of 52 miles, and the work involved a value of ap-

BLAIRSTOWN—COLUMBIA ROAD, WARREN COUNTY, NEW JERSEY—BEFORE IMPROVEMENTS.



OCEAN CITY ROAD, CAPE MAY COUNTY, NEW JERSEY, BEFORE IMPROVEMENT.



OCEAN CITY ROAD AFTER IMPROVEMENT. GRAVEL ROADWAY ON HEAVY FILL.

proximately $666,000.00 These roads were situated in Atlantic, Bergen, Essex, Gloucester, Hunterdon, Mercer, Middlesex, Passaic, Salem, Somerset, Sussex and Union Counties.

Since the passage of the state aid law in 1891, 17,339,540 sq. yds. of road have been built by state aid in the various counties of the state. The yardage of each kind of road built is shown in Table IV.

The expenditure from the motor vehicle funds for repair work, amounting to $590,226.28 (see Table III.), was expended in amounts ranging from a few dollars to $25,000. In addition to this total, there was expended by the counties approximately $1,455,000 for repairs.

TABLE IV—MILEAGES OF VARIOUS KINDS OF ROADS BUILT IN NEW JERSEY COUNTIES SINCE THE PASSAGE OF THE STATE AID LAW

Kind of Road	Yardage
Macadam	9,019,238
Macadam with Bituminous Dressing	868,663
Bituminous Macadam	153,027
Bituminous Mortar Macadam	19,293
Hot Mixed Bituminous Cement	200,015
Cold Mixed	796,861
Gravel	6,076,420
Concrete Base with Bituminous Top Dressing	10,513
Oyster Shells	195,510

NEWS NOTES

Gibson County, Ind., has issued $1,027,170 road bonds during the past 15 years, according to figures compiled by County Treasurer Milton Cushman.

County Surveyor C. H. Zoll of Dade County, Fla., reports a total of 380 miles of hard surfaced roads in the county, representing an investment of $760,000.

The State of Maryland will have 1,000 miles of modern roads, representing a total cost of $17,564,464, when present contracts are completed, according to reports.

State Highway Engineer W. E. Atkinson, of Louisiana, reports that there are 550 miles of improved roads in that state built at a cost of approximately $2,000,000.

Gravel Roads, 273.41 Miles in Total Length, were built in Porter County, Indiana, during the 15 years ending Dec. 31, 1914, according to the report of County Auditor C. A. Blachly. The cost of maintenance for that period averaged $112.03 per mile.

BLAIRSTOWN—COLUMBIA ROAD AFTER IMPROVEMENT—MACADAM ON GRAVEL BASE.

Report on Snow Removal Work in the City of New York

In a recent report to the Board of Estimate and Apportionment of New York City, Commissioner J. T. Fetherston of the Department of Street Cleaning reviews the work of snow removal during the winter of 1914-1915, when the plan of using the forces of the department instead of private contractors on most of the streets and the utilization of sewers for the disposal of snow was tried for the first time.

According to the department's statistics, 32,607,081 sq. yds., or 927 miles of streets in the Boroughs of Manhattan, the Bronx and Brooklyn were included in the snow removal area. Of this the department's snow fighting force covered 26,199,317 sq. yds., or 745 miles; 3,304,009 sq. yds., or 94 miles of so-called mandatory streets were included in the private contract schedule and the street railways cared for 3,103,755 sq. yds., or 88 miles. The division of the total area according to boroughs is shown in Table I.

TABLE I—PHYSICAL ELEMENTS OF NEW YORK CITY'S SNOW PROBLEM, SHOWING AREA AND MILEAGE OF STREETS SCHEDULED FOR SNOW REMOVAL AND THE DIVISION OF LABOR.

	Total Area and Mileage for Snow Removal.		Schedule for Departm't's Snow Fighting Force.		Mandatory Street Schedule for Contractors.		Schedule for Removal by Street Railways.	
Borough.	Area, Sq. Yds.	Length, Miles.	Area, Sq. Yds.	Length, Miles.	Area, Sq. Yds.	Length, Miles.	Area, Sq. Yds.	Length Miles.
Manhattan	15,905,824	452	12,830,851	365	1,839,382	52	1,235,591	35
The Bronx	3,839,044	109	3,154,605	90	250,227	7	434,212	12
Brooklyn	12,862,213	366	10,213,861	290	1,214,400	35	1,433,952	41
Total	32,607,081	927	26,199,317	745	3,304,009	94	3,103,755	88

TABLE II—AREA CLEARED BY USE OF SEWERS.

	Storm of Feb. 1-3.		Storm of Mar. 6-7.		Storm of Apr. 3.	
Borough.	Sq. Yds.	Per cent. of Total Area.	Sq. Yds.	Per cent. of Total Area.	Sq. Yds.	Per cent. of Total Area.
Manhattan	3,084,780	24	7,818,066	61	7,797,393	60¾
The Bronx	659,000	6½	5,390,874	52¾	7,747,420	75¾
Brooklyn	749,427	23¾	1,287,005	40¾	643,636	20½
Total	4,493,207	17¼	14,495,945	55¼	16,188,449	61¾

In summarizing the results attained under the new plan, Commissioner Fetherston finds:

A—On a truck capacity basis of removal: The rate of removal per day increased 4.71 times and the cost per cu. yd. decreased 77.3 per cent. compared with average results between 1907 and 1914, while the rate of removal per day doubled as compared with the best previous record (1914) and the cost per cu. yd. decreased 67 per cent. compared with the lowest previous unit cost record (1908).

B—On an area basis of removal (area of street surface multiplied by depth of snow) considering only the department's snow fighting force:

The rate of removal per day increased 3.35 times and the cost per cu. yd. decreased 80 per cent., compared with average results between 1902 and 1907, while the rate of removal per day doubled and the cost per cu. yd. decreased 75 per cent., compared with the lowest season's unit cost record of 1906-1907.

It was necessary to start working on three storms with a combined fall of 22.4 ins. and the total cost of snow work for the winter was $523,892. Commissioner Fetherston figures that if all snow in 1914-1915 had been handled by private contract, the cost at the lowest previous contract rate would have been $1,584,882 while, at the trucking rate for 1914-1915, the cost would have been $2,370,846. However, the report points out, the weather conditions after the storms were favorable to the dispersal by melting and, while neither of the foregoing amounts can be accepted as conclusive, it may be conservatively estimated that the new system saved the city at least $500,000.

TABLE III—COMPARISON OF CITY AND CONTRACT SNOW REMOVAL, 1914-1915.

	Days Work.	Cost	Cu. Yds. Removed per day.	Cost per Cu. Yd.
Contract work	16	$252,536	28,723	0.549
City work	16	271,356	241,182	0.079

The organization for snow removal was divided into three distinct classifications. The first was known as the snow fighting force and consisted of the forces of the department supplemented by about 40,000 emergency laborers who were notified by the Police Department as their services became necessary. This force was organized in three divisions as follows:

A—Regular force composed of department employes supplemented by emergency laborers. The unit organization was based on the sweeper as squad leader, acting under the general directions of regular department officers.

B—First reserve force consisting of regular drivers with horses and carts intended for night work.

C—Second reserve force consisting of trucks holding permits from the department and private trucks.

Of these three divisions, the first was the only one used during the entire winter.

The second classification was known as the snow removal force and was composed of contractors' men and trucks, supervised by loading and dumping foremen detailed from several city departments. This force was called out in Manhattan for all storms, but was used in the Bronx and Brooklyn during only two storms.

The third classification included the forces of the street railways which, according to Commissioner Fetherston, did not complete work on the areas assigned to them.

In concluding his report, Commissioner Fetherston says: "On the whole, the first year's experience with the snow fighting force has been encouraging and, with slight modifications, will be continued in service next season. The results secured warrant the belief that practically all sewers can be used for the disposal of snow, including pipe sewers greater in diameter than 12 ins., when water from hydrants is used to supplement the ordinary flow of sewage.

"The basic principle of the snow fighting plan, that of starting during the storm and fighting it, likewise proved satisfactory, though it is probable that, with more adverse weather conditions, including low temperatures and a blizzard, it would not be possible to secure laborers in sufficient numbers to work while a storm is in progress. Yet, even conceding this as a fact, there still remains the possibility of working after the storm is over and using the sewers for snow disposal."

The Indianapolis-New Albany Dixie Highway Association has been organized at Paoli, Ind., with the following officers: President, Perry McCart, Paoli; Vice President, J. T. McNutt, Martinsville; Secretary-Treasurer, Thomas J. Sare, Bloomington.

The Board of Aldermen of Buffalo, N. Y., has authorized a $200,000 bond issue for the construction of a new viaduct over Chicago Street, to replace a structure which has been closed for two years, having been condemned as unsafe for traffic.

COMING MEETINGS

June 22-25—Society for the Promotion of Engineering Education—Annual meeting. Iowa State College, Ames, Ia. Secretary, F. S. Bishop, University of Pittsburgh, Pittsburgh, Pa.

June 22-26—American Society for Testing Materials.—Annual meeting, Atlantic City, N. J. Secretary, Edgar Marburg, University of Pennsylvania, Philadelphia, Pa.

June 25-July 1.—The County Councils Association (Great Britain).—National Road Conference and Exhibition, London, England. Organizing Secretary, G. Montagu Harris, Secretary of the County Councils Association; Business Manager, A. F. May, 13 Victoria Street, Westminster, S. W., London, England.

July 14-16—North Carolina Good Roads Association—Annual meeting, Asheville, N. C. Secretary, Joseph Hyde Pratt, Chapel Hill, N. C.

August 4-5—Texas Good Roads Assocition and County Judges' and Commissioners' Association—Mid-Summer Meeting, Agricultural and Mechanical College of Texas, College Station, Tex. Secy., Texas Good Roads Association, D. E. Colp, San Antonio.

Sept. 13.—Tri-State Roads Association.—Third annual convention, San Francisco, Cal. Executive Secy., Geo. E. Boos, 1220 Flood Bldg., San Francisco, Cal. (Meeting to be merged with the Pan-American Road Congress.)

September 13-17—American Road Builders' Association and American Highway Association.—Pan American Road Congress, Oakland, Cal. Secretary, American Road Builders' Association, E. L. Powers, 150 Nassau St., New York, N. Y. Executive Secretary, American Highway Association, I. S. Pennybacker, Colorado Bldg, Washington, D. C.

October 4-7—Northwestern Road Congress—Annual meeting, Cedar Rapids, Ia. Secy.-Treas., J. P. Keenan, Sentinel Bldg., Milwaukee, Wis.

October 11-12—National Paving Brick Manufacturers' Association—Annual convention, Dayton, O. Secretary, Will P. Blair, B. of L. E. Bldg., Cleveland, O.

October 12-14—American Society of Municipal Improvements—Annual convention. Dayton, O. Secretary, Charles Carroll Brown, 702 Wulsin Building, Indianapolis, Ind.

November 17-19—National Municipal League—Annual convention. Dayton, O. Secretary, Clinton Rogers Woodruff, 705 North American Building, Philadelphia, Pa.

New York State County Highway Superintendents

The semi-annual meeting of the County Highway Superintendents of New York State will be held at Niagara Falls, N. Y., on June 23 and 24.

The program for the first day includes an automobile trip over the roads of Niagara County. The route has been arranged to include points of historic interest, in which the county is particularly rich, and the famous Niagara County fruit belt.

On the second day, there will be a trip to various points of interest around Niagara Falls, a ride through the Niagara River Gorge and a steamer trip to Toronto, Ont. If time permits, an inspection of the improved roads in the vicinity of that city will be made.

The county superintendents have no formal organization but are an adjunct of the State Bureau of Town Highways of which Third Deputy State Highway Commissioner Benjamin J. Rice is the head.

National Paving Brick Manufacturers

The Board of Directors of the National Paving Brick Manufacturers' Association, at their quarterly meeting held in Cleveland, May 27, affirmed arrangements tentatively made for holding the annual meeting October 11 and 12 at Dayton, Ohio. During this week, namely October 12, 13 and 14, will be held the annual meeting of the American Society of Municipal Improvements. This arrangement will not only enable the members of the National Paving Brick Manufacturers' Association to attend the meeting of the American Society but it will also give the engineers of Ohio, Indiana and Kentucky and other states who have not heretofore been members of the American Society of Municipal Improvements an opportunity to attend that meeting and become enlisted in its roll of membership.

PERSONAL NOTES

I. A. Baum has been elected City Engineer of Texarkana, Ark.

J. J. Armstrong has been appointed Assistant City Engineer of Butte, Mont.

F. N. Bingham, Superintendent of Paving, Spokane, Wash., has resigned and joined the Clifton-Applegate Co., paving contractors, of Spokane.

P. F. Patton, of Hendersonville, N. C., has been appointed Supervising Engineer of the road work to be done in Greenville County, N. C., under a $950,000 bond issue.

William T. Crowley, formerly of the Pennsylvania State Highway Department, has gone into private practice, with offices at 31 West Main Street, Lock Haven, Pa.

Edward M. Hagar, former President of the Universal Portland Cement Co., will be President of a company to be known as the Hagar Portland Cement Co. It is reported that the new company will be capitalized at $2,000,000 and will operate a chain of plants extending from the Atlantic Seaboard to the Rocky Mountains.

Austin Lord Bowman, Chief Engineer of the Department of Bridges, New York City, died recently at his home in that city. Mr. Bowman was born in Manchester, N. H., in 1861. He studied engineering at Yale, graduating with the class of 1883. He entered the city service in 1907. He was a member of a number of engineering societies.

Charles U. Powell has been appointed Chief Engineer of the Topographical Bureau, Borough of Queens, New York City, to succeed Clifford B. Moore, who was appointed Consulting Engineer of the Borough as noted in "Good Roads" for April 24. Mr. Powell has been acting as head of the bureau since Mr. Moore's promotion and has been in the city service for the past 15 years. He will receive a salary of $6,000.

The Universal Portland Cement Co., announces the following changes: R. F. Atkins, Assistant Credit Manager at Chicago, appointed Eastern Credit Manager at Pittsburgh, vice L. S. Fuqua, deceased; Ray S. Huey, Assistant General Superintendent, Buffington Plant, appointed Superintendent, Duluth Plant; Fred Robinson, appointed Assistant Superintendent, Duluth Plant; C. O. Sonderquist, Superintendent Mill No. 6, Buffington Plant, appointed Assistant General Superintendent of that plant; J. H. Kempster, Chief Chemist, Buffington Plant, appointed Superintendent Mills Nos. 3 and 4, of that plant; M. S. Humphreys, Chief Draftsman, appointed Superintendent Mill No. 6, Buffington Plant.

The Muhlenberg County Good Roads Association has been formed in Muhlenberg County, Ky. The organization will work for the improvement of highways in general and for the construction of a highway from Muhlenberg County through Logan County to Russellville where it will connect with the proposed west branch of the Dixie Highway.

NEWS OF THE TRADE

The Boston, Mass., office of the Sullivan Machinery Co., is now located at Room 1010 Unity Building, 185 Devonshire Street, Boston, Mass.

The Turnbull Wagon Co., Defiance, O., has declared the regular semi-annual dividend of 3½ per cent., on its preferred stock, payable July 1 to stockholders of record June 8.

The Atlas Portland Cement Co., New York City, N. Y., has issued the June number of "The Atlas Almanac." As usual, it is replete with useful information and is profusely illustrated.

The 13th edition of the Hy-Rib Handbook has been issued by the Trussed Concrete Steel Co., Detroit, Mich. All of the various types of Hy-Rib are shown, with their applications to various types of construction. The handbook contains 144 pages and many half-tone illustrations showing new applications of Hy-Rib.

The Granite Paving Block Manufacturers' Association of the United States has issued a booklet entitled "Permanent Paving." It is bound in heavy gray paper with embossed title and contains 16 pages. The subject matter deals with the use of improved granite block paving in New York City, Lowell, Mass., Albany and Troy, N. Y., Newark, N. J., Brookline, Mass., Philadelphia, Pa., and Worcester, Mass. The booklet is profusely illustrated with half-tone reproductions of street scenes in the cities named.

NEWS NOTES

The City Commission of Dallas, Tex., has awarded paving contracts aggregating $130,000.

Governor Whitman of New York has vetoed measures carrying appropriations of $212,500 for bridges.

Somerville, Mass., Will Spend $137,000 on streets and sidewalks during the present season.

Cambria County, Pennsylvania, will spend $170,409 on 109 miles of roads during the present season.

A North and South Highway from Winnipeg, Canada, to New Orleans, La., is being agitated in the two cities.

Tuscaloosa County, Ala., has awarded the first of a series of road contracts under an appropriation of $100,000.

Rowan County Kentucky, will hold an election in November on the question of issuing road bonds to the amount of $100,000.

The Chamber of Commerce of Petersburg, Va., is urging the construction of a 100-ft. boulevard from Petersburg to Hopewell.

County Engineer Wilson of Newcastle County, Del., has recommended the resurfacing of approximately 157,317 sq. yds. of [illegible] roads.

A Special Election on a $200,000 Road Bond Issue in Maury County, Tenn., has been postponed until some time in the early winter.

The Authorities of Alexandria, Louisiana, have awarded paving contracts aggregating $93,232.20 to A. R. Young & Co., of Lawrence, Kan.

An Election on a $3,000,000 County Bond Issue for good roads will be held in Fresno County, Cal., on October 26, according to a recent report.

The Voters of Palm Beach County, Fla., have voted in favor of the project to issue $800,000 in road bonds, mentioned in "Good Roads" for May 1.

The Bulevar Orono, Rosario, Argentina, is being paved with asphalt by the Anglo-Mexican Petroleum Products Co., Ltd., of Buenos Aires, Argentina.

Mayor Ellis, of Grand Rapids, Michigan, is authority for the statement that the city has approximately $375,000, which can be made available for street improvement.

The Eureka Paving Co., Houston, Tex., has been awarded the contract for paving the Main St. boulevard at Houston, with asphaltic concrete at a cost not to exceed $150,000.

The Warner-Quinlan Co., of Syracuse, N. Y. has been awarded a contract for paving a number of Syracuse streets with asphalt. The company's bid was $1.49 per sq. yd. The total expenditure will amount to about $100,000.

Utah County, Utah, will hold an election on a $500,000 bond issue in the near future. The money will be used for the construction of 40 miles of concrete roads extending north and south through the county.

The Town of Darien, Conn. will issue bonds to the amount of $150,000 for road construction and maintenance in accordance with the result of a recent election at which it was also decided to appoint a highway commissioner.

The County Commissioners of Pinellas County, Florida, have called a special election for July 3 on a proposed bond issue of $500,000 for road building. Of this amount, $250,000 will be used to retire time warrants which will be voted on the same day.

The City Council of Corpus Christi, Tex., has awarded a contract for 86,000 sq. yds. of bithulithic paving to the Texas Bithulithic Co. The company's bid was $2.48 per sq. yd. With the curbing and gutters, the contract will amount to about $256,000.

Harris County, Texas, is contemplating another bond issue for $1,000,000 for the improvement of county roads and the construction of several bridges, including a steel lift bridge across Clear Creek at Seabrook. Galveston County will pay half of the cost of this bridge.

The Board of County Commissioners of Miami County, O., has decided to levy a 2-mill tax for the purpose of rebuilding wornout roads. Under present conditions, the tax will yield about $144,000 annually. It is believed that the entire county road system can be completed in about five years.

The Good Roads Committee of the County Board of Will County, Ill., has recommended the purchase of a 10-ton road roller, a grader, scarifier, sprinkler, plow, culvert form and concrete mixer for use in the 24 towns in the county. The plan has the approval of the road officials of the various towns.

The Board of Public Works of Indianapolis, Ind., has awarded a contract for paving Parkway Boulevard from 18th to 30th Streets, with bituminous concrete, to the American Construction Co., of Indianapolis. The contract price is $3.20 per lineal foot on each side of the boulevard and $25,000 for street and alley intersections.

Members of the Women's Club of Geneva, Ill., were hostesses at a recent meeting of the Kane County, Ill., Federation of Women's Clubs at which the principal topic was "good roads." Addresses were made by S. E. Bradt, Secretary of the Illinois State Highway Commission, and George N. Lamb, Superintendent of Highways of Kane County.

The Board of Public Utilities of Los Angeles, Cal., is considering plans for the construction of at least four viaducts across the bed of the Los Angeles River and the railroad tracks on each side. It is estimated that the work will cost about $3,500,000 of which the railroads will pay half and the city, Los Angeles County and the street railways the other half.

The Georgia-Florida Highway Association, comprising counties in Western Georgia and Northern Florida, was organized recently at Quitman, Ga. The following officers were elected: President, W. C. Vereen, Moultrie, Ga.; First Vice President, D. G. Malloy, Quitman, Ga.; Second Vice President, J. L. Fonda, Madison, Fla.; Secretary, John W. Greer, Moultrie, Ga.; Treasurer, Herbert Stubbs, Quitman, Ga.

Citizens of Lehigh and Northampton Counties, Pa., and the cement manufacturers of Eastern Pennsylvania have entered into an agreement with the Pennsylvania State Highway Department to furnish sufficient cement to build a road 12 miles long from the borough line of Allentown to the borough line of Bethlehem and continuing thence to Easton. According to estimates over 40,000 barrels of cement will be required. Plans are also under way to have the citizens furnish the stone required.

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Copy for advertisements of which proofs are to be submitted to advertisers should reach the New York office as follows: For insertion in the first issue of the month, by the fifteenth of the preceding month; for other issues, by noon on Thursday of the week before date of issue.

Copy for all advertisements of which proofs need not be submitted—including "Proposal," "For Sale," "Want" and other classified advertisements—will be accepted until noon on Thursday of the week of issue.

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State of Iowa Has Made Many Changes in Road Laws

The last Iowa General Asembly made many changes in the state road laws, but a large proportion are purely administrative in character and do not affect the general operation of the laws as they formerly existed.

In a number of instances, however, the changes are somewhat radical and among them is a provision requiring the townships to install all temporary culverts on township roads, the county supervisors being required to furnish only the material, delivered at the railroad station nearest to the improvement.

Under the laws, as amended, highways lying along corporate limits of towns and cities below the first class, are included in the county road system under the care of the board of supervisors. There is also a provision for joint action between boards of supervisors and councils of cities of the first class on corporate line roads.

Another important provision is that empowering boards of supervisors to condemn land for necessary road improvements. This, it is believed, will be of great assistance in eliminating danger spots and bad crossings.

Texas Highway Commission Bill to be Introduced at Special Session

As noted in a previous issue of "Good Roads," a bill for the establishment of a State Highway Commission in Texas, was prepared early in the year. Owing to a press of other matter, however, the bill was not introduced at the regular session of the Legislature.

It is expected that the Governor will call a special session of the Legislature to meet either in the autumn or winter and the Texas Good Roads Association, which is supporting the bill, feels assured that the measure will be included in the call.

The proposed bill provides for a State Highway Commission of three members to be appointed by the Governor for terms of six years. Each member shall be allowed expenses and per diem compensation of $10, provided the total expense of the commission for per diem and traveling shall not exceed $1,000 a year.

The commission shall elect a State Highway Engineer who, with the Commission, shall constitute the State Highway Department. Funds for the maintenance of the department are provided for by a tax of $1 on motorcycles and $5 on all other motor vehicles.

Another proposed bill which is, in a measure, co-ordinate with the foregoing, provides for the creation of county highway departments consisting of the members of the county commissioners' court and a county superintendent of highways to be appointed by the court. These county highway departments, according to the provisions of the proposed measure, shall have charge of the construction and maintenance of roads, bridges and culverts under the general supervision of the proposed State Highway Department.

The county highway superintendents are required to divide their territory into road districts, each in charge of a superintendent who shall have power, under the direction of the commissioners' court, to call out all persons liable to work on the roads. Exemption for road work may be secured by the payment of $3 a year to the county treasurer.

The measure also carries a provision for the employment of convict labor on the roads, each convict to receive a credit of 50 cents a day to be applied first on his fine and then on the costs of his case. The commissioners' courts are empowered to grant commutation up to one-fourth of a convict's sentence for good behavior and faithful service.

Exhibition of Street Cleaning Appliances in New York City

The second annual exhibition of street cleaning apparatus and appliances will be held in the armory of the First Regiment of Field Artillery, New York City, during the week beginning October 11, under the auspices of the New York City Department of Street Cleaning.

Commissioner J. T. Fetherston of the department, has announced that the last exhibition, although it was largely in the nature of an experiment, was so successful and aroused so much interest in the subject of street cleaning, that it has been decided to go into the mater more thoroughly this year.

Exhibitors will be required to pay no entrance fee and the space in the armory will be free, but all costs of placing exhibits must be borne by exhibitors who must also assume all risks. Free storage will be provided for apparatus arriving in New York City prior to the evening of October 9.

Applications for space should be made to Joseph R. Buchanan, Director of Exhibits, Department of Street Cleaning, Municipal Building, New York City, before September 10, and must state the character of the exhibit and the number of square feet of space required.

On October 9, there will be a parade of several hundred uniformed employes of the Department and selected pieces of the Department's equipment. Positions will be assigned to exhibition entries whose owners desire to take part in the parade.

Street cleaning apparatus eligible to entry in the exhibition includes all sorts of brooms, brushes, sweepers, flushers, carts, wagons, motor trucks or other vehicles used for collecting garbage, ashes, rubbish and street sweepings, conveyances for transporting refuse by water or rail, methods for disposing of garbage, ashes and other refuse, including garbage crematories, incinerators, destructors, etc.

Pennsylvania's Governor Approves Highway Appropriations of $8,300,000

Governor Brumbaugh of Pennsylvania has approved the appropriations for the use of the State Highway Department almost in full. As passed by the Legislature, the appropriations amounted to $8,400,000. As approved by the Governor, the sum is $8,300,000, a cut of $50,000 having been made in the item for the purchase or condemnation of turnpikes and another cut of a similar amount having been made from the $100,000 appropriated for repair and maintenance of the Cumberland Road.

In the general appropriation bill, $350,000 was allowed the Department for engineers, clerks, etc., $110,000 for traveling expenses of engineers, superintendents, paymasters, etc., $180,000 for salaries and expenses of the Automobile Division of the State Highway Department and $40,000 for completing surveys and plotting of county and township roads.

Important Changes in the Highway and Bridge Laws of Michigan

The last Michigan Legislature passed a number of important amendments to the State highway and bridge laws and to the county road law.

One amendment provides that application must be made to the Michigan Railroad Commission before laying out any highway across any railroad tracks, the Railway Commission being empowered to deny the application, to order a relocation or to demand a separation of grades.

Another section raises the maximum amount of the good roads district tax from $2 to $3 per $1,000 valuation and still another section requires boards of supervisors to submit all questions regarding bond issues or other forms of interest bearing indebtedness to a vote of the electors only on petition of at least 10 per cent. of the freeholders resident in the road district.

Boards of supervisors are empowered to determine the number of county road commissioners, not exceeding three, to be elected. If only one commissioner is designated, he shall hold office for two years. If two are decided upon, one shall be elected biennially for a term of four years, while in case three are designated, the term of office shall be six years, with biennial elections of one commissioner. The supervisors may reduce the number of commissioners by directing that no election be held.

The employment of a county road engineer is made mandatory and boards of supervisors are required to file a map of a proposed system of county highways with the State Highway Commissioner. It is hoped that this amendment will be the means of securing a more connected system by bringing all county roads together at county lines. This section also provides that county road commissioners may improve through roads within the limits of villages and cities, provided no improvement exceeds 16 ft. in width or involves material more expensive than concrete or brick. No state reward is allowed on such roads.

County road commissioners may borrow not to exceed 75 per cent. of the county road tax voted, before the tax is collected, in order to complete roads under construction. Counties whose valuation does not exceed $40,000,000 may levy a 3-mill tax.

The State Highway Department is required to construct and maintain all bridges of greater than 30-ft. span on state reward roads, provided the district, township of county spends an amounts on the road equal to the combined cost of the bridge and the state reward.

Much Bridge and Culvert Work Now Under Way in Iowa

Since January 1, the Iowa State Highway Commission has received and approved contracts for bridges and culverts to the amount of $494,672. These contracts have come in from the following 38 counties only, and have involved the amounts stated:

Benton, $4,238; Black Hawk, $19,568; Bremer, $10,975; Calhoun, $16,831; Carroll, $6,481; Cass, $5,726; Cedar, $13,200; Cherokee, $19,524; Chickasaw, $13,200; Clark, $3,187; Clay, $33,701; Cayton, $7,148; Crawford, $8,555; Dallas, $4,387; Decatur, $2,537; Fayette, $11,889; Floyd, $1,748; Greene, $9,302; Harrison, $17,480; Howard, $10,110; Ida, $21,125; Jefferson, $7,913; Johnson, $5,099; Jones, $5,513; Lee, $10,640; Linn, $22,367; Madison, $5,610; Marion, $31,028; Marshall, $14,550; Mitchell, $10,806; O'Brien, $13,119; Osceola, $6,475; Palo Alto, $9,488; Plymouth, $9,000; Story, $34,882; Tama, $39,980; Warren, $9,250; Winneshiek, $18,100.

In many of the counties named a large amount of additional bridge and culvert work is being done by day labor or on contracts not requiring the approval of the State Highway Commission. In the 61 other counties of the state, it is estimated that approximately $2,000,000 worth of work of this character is under way, making an estimated total of over $3,000,000 worth of new bridges and culverts in process of construction.

Multnomah County, Oregon, Awards Contracts For 88 Miles of Roads

The Board of County Commissioners of Multnomah County, Ore., awarded contracts this week for 88 miles of roads under the $1,250,000 bond issue, mention of which has been made in several recent issues of "Good Roads." This is said to be one of the largest country road contracts ever let in America.

Most of the work will consist of surfacing old macadam roads with Warrenite. The average cost per mile for the entire contract will be approximately $14,000.

The successful bidders and the mileage awarded are as follows: Warren Construction Co., Portland, Ore., 40 miles Warrenite; Pacific Bridge Co., Portland, 12 miles Warrenite; Oscar Huber, Portland, 10 miles Warrenite; Clark & Henry Construction Co., Sacramento, Cal., 12 miles Warrenite; scattering contracts for concrete, 13 miles; scattering contracts for brick, 1 mile.

Average Prices Paid for Brick Paving during 1914 in nine Wisconsin cities were as follows: Appleton, $1.99 per sq. yd.; Eau Claire, $2.34; Kenosha, $1.81; La Crosse, $2.65; Madison, $2.05; Oshkosh, $2.90; Racine, $2.03; Sheboygan, $1.98.

An Order for 200,000 Barrels of Portland Cement for use in the State of Washington, notice of which appeared in "Good Roads" for May 29, failed to attract bidders. The order will be divided and separate bids asked on the following quantities: Seattle, 30,000 barrels, Tacoma, 20,000, Pierce County, 24,000, King County, 81,000, Seattle Port District, 30,000, Inter-County River Improvement District, 15,000.

COMING MEETINGS

July 14-16—North Carolina Good Roads Association—Annual meeting, Asheville, N. C. Secretary, Joseph Hyde Pratt, Chapel Hill, N. C.

August 5-7.—Texas Good Roads Association and County Judges' and Commissioners' Association—Mid-Summer Meeting, Agricultural and Mechanical College of Texas, College Station, Tex. Secy., Texas Good Roads Association, D. E. Colp, San Antonio.

August 11-12.—Pacific Highway Association.—Fifth annual meeting, San Francisco, Cal. Secretary, Henry L. Bowlby, 510 Chamber of Commerce Bldg., Portland, Ore.

Sept. 13.—Tri-State Roads Association.—Third annual convention, San Francisco, Cal. Executive Secy., Geo. E. Boos, 1220 Flood Bldg., San Francisco, Cal. (Meeting to be merged with the Pan-American Road Congress.)

September 13-17—American Road Builders' Association and American Highway Association.—Pan American Road Congress, Oakland, Cal. Secretary, American Road Builders' Association, E. L. Powers, 150 Nassau St., New York, N. Y. Executive Secretary, American Highway Association, I. S. Pennybacker, Colorado Bldg, Washington, D. C.

October 4-7—Northwestern Road Congress—Annual meeting, Cedar Rapids, Ia. Secy.-Treas., J. P. Keenan, Sentinel Bldg., Milwaukee, Wis.

October 11-12—National Paving Brick Manufacturers' Association—Annual convention, Dayton, O. Secretary, Will P. Blair, B. of L. E. Bldg., Cleveland, O.

October 12-14—American Society of Municipal Improvements—Annual convention. Dayton, O. Secretary, Charles Carroll Brown, 702 Wulsin Building, Indianapolis, Ind.

November 17-19—National Municipal League—Annual convention. Dayton, O. Secretary, Clinton Rogers Woodruff, 705 North American Building, Philadelphia, Pa.

Texas Good Roads Association

Reservations for the joint semi-annual convention of the Texas Good Roads Association and the County Judges' and Commissioners' Association, which will be held at the Texas Agricultural and Mechanical College, College Station, Tex., August 5, 6 and 7, indicate a large attendance.

The convention is expected to draft a state highway bill and amendments to existing road laws. An exhibition of road machinery, etc., will be a feature of the convention.

Pan-American Road Congress

Invitations are being sent by the Executive Committee of the Pan-American Road Congress, of which Governor Charles W. Gates of Vermont, is Chairman, to the governors of the states, the lieutenant governors of the Canadian provinces and to the presidents of the South American republics, asking them to attend in person and to send delegates to the Congress. It is expected that there will be a large attendance in response to the invitations.

As has been stated in previous issues of "Good Roads," the Congress will be held at Oakland, Cal., September 13 to 17, under the joint auspices of the American Road Builders' Association and the American Highway Association, co-operating with the Tri-State Good Roads Association, the membership of which covers the states of California, Oregon and Washington.

The program for the convention, which is now in course of preparation, covers thoroughly the subject of road building and street improvement. Papers and discussions will be handled by men who are acknowledged experts in their respective fields and it is believed that the Congress will bring together the largest number of men interested in highway and street improvement ever assembled. Special trains are being arranged for to accommodate delegates from the East.

The plans for the Congress are in the hands of an Executive Committee of five men, as has been previously noted in these columns. The members of the committee, in addition to Governor Gates, the Chairman, are Major W. W. Crosby, former State Highway Engineer of Maryland; James H. MacDonald, former State Highway Commissioner of Connecticut; J. E. Pennybacker, Division of Economics, U. S. Office of Public Roads, and E. L. Powers, Editor of "Good Roads."

MEETINGS

The Society for the Promotion of Engineering Education held its annual meeting at the Iowa State College, Ames, Ia., on Tuesday, Wednesday, Thursday and Friday of this week. A report of the proceedings will appear in a later issue of "Good Roads."

The annual meeting of the American Society for Testing Materials is in session at Atlantic City, N. J., as this issue of "Good Roads" goes to press, the final session being held today. The program, or that portion of it which is of especial interest to road builders, was published in the issue of May 22. A report of the meeting will appear in a subsequent issue.

PERSONAL NOTES

C. E. Arnold has been appointed City Engineer of Woodland, Cal.

A. T. Dickey has been elected City Engineer of Galveston, Tex.

George Roberts has been elected Street Commissioner of Durant, Okla.

Edward S. Smith has resigned as State Highway Engineer of Idaho, his resignation taking effect on June 1.

Michael A. Rofrano has resigned as Deputy Street Cleaning Commissioner of New York City, N. Y.

Commissioner A. M. Helffrich has been placed in charge of the Department of Streets and Public Improvements. Ottawa, Ill.

Prof. Charles L. Crandall of the Cornell University College of Engineering, Ithaca, N. Y., retires this month after 41 years of continuous service.

G. Halbfoss, former Assistant City Engineer of Muscatine, Ia., has been appointed County Engineer of Muscatine County, succeeding James J. Ryan.

Eugene M. Booth has been appointed State Highway Engineer of Idaho, to succeed E. S. Smith, whose resignation is noted elsewhere on this page.

Herbert Nunn has been appointed Engineer in Charge of the highway construction in Multnomah County, Ore., noted elsewhere in this issue. Mr. Nunn was City Engineer of El Paso, Tex., from 1911 to 1913.

Henry Welles Durham, M. Am. Soc C. E., Chief Engineer of Highways, Borough of Manhattan, New York City, has associated with Percival R. Moses, with offices at 366 Fifth

Avenue, New York City. Mr. Durham will engage in municipal engineering work.

E. A. Byrne, Assistant to the Chief Engineer, Department of Bridges, New York City, has been appointed Acting Chief Engineer. It has been announced that no Chief Engineer will be appointed at this time to succeed the late Austin Lord Bowman, notice of whose death appeared in the last issue of "Good Roads."

Julian C. Field, Consulting Engineer, Denison, Tex., has been retained by the Commissioners' Court of Grayson County, Tex., to act in conjunction with the Citizens' Advisory Committee in designing and supervising the construction of the proposed highway system provided for by the $900,000 bond issue recently voted for that purpose.

NEWS OF THE TRADE

The Troy Wagon Works Co., Troy, O., has issued a 30-page booklet entitled "Income Facts." It deals with the Troy reversible wagons and contains many half-tone illustrations of the wagons and their distinctive features.

A 40-page catalogue has been issued by the Detroit Trailer Co., Detroit, Mich. It contains specifications and half-tone reproductions of the various types of trailers manufactured by the company, and numerous testimonials.

Two booklets descriptive of the Standard low-charging concrete mixers have been issued by the Standard Scale & Supply Co., Pittsburgh, Pa. The booklets are well printed on good quality paper and contain half-tone reproductions of the several types of mixers made by the company.

The Austin-Western Road Machinery Co., Chicago, Ill., has issued circulars describing two of the latest additions to the company's line of earth handling and road making machinery, the Austin road-ripper and the Western No. 10 traction engine grader. The circulars are illustrated and describe fully the special features and purposes of the machines.

The Panama-Pacific Exposition has awarded two grand prizes, five medals of honor and two gold medals to the Holt Manufacturing Co., Stockton, Cal. These awards indicate scorings of 95 per cent. or better. Grand prizes were given on the Caterpillar tractor and the Holt combined harvester. Medals of honor were awarded for the Caterpillar disc engine plow, Caterpillar moldboard engine plow, Caterpillar disc harrow, Caterpillar wagon and Holt wood bar engine harrow. The Caterpillar land leveler and the Caterpillar sage brush plow received gold medals.

NEWS NOTES

The Board of Control of Toledo, O., has awarded paving contracts aggregating $63,165.

Harris County, Tex., has spent $690,105.59 of a million dollar road bond issue voted some time ago.

The Voters of Austin, Tex., have ratified a bond issue of $725,000 of which $250,000 will be used for street improvements.

The Board of County Commissioners of Floyd County, Ga., has awarded contracts for three bridges to cost approximately $[illegible].

The Board of Supervisors of Ontario County, N. Y., has appropriated $52,132.50 for improving the [illegible] Orleans Road and village highways in Clifton Springs, [illegible] and [illegible].

The Contract for Paving Main Street, Ojibway, Ont., has been awarded to John Dewhirst, Woodslee, Ont. The work will cost about $120,000.

The Indianola Commercial Club of Indianola, Ia., has offered cash prizes amounting to $300 for road dragging during the present season.

The County Commissioners of Allegheny County, Pa., have authorized the improvement of six highways at an estimated cost of $130,000.

The Board of Freeholders of Hudson County, N. J., has asked for bids on a bond issue of $1,060,000 which will include $260,000 for roads and bridges.

The State of California has agreed to construct a link of an ocean-to-ocean highway between the boundary line of San Bernardino County, Cal., and Yuma, Ariz.

The County Commissioners of Clay County, Ind., have ordered the construction of 2½ miles of brick pavement between Brazil and Carbon, Ind. The improvement will cost about $70,000.

A New State Highway between South Deerfield and Conway, Mass., will be a gravel road with asphalt surface. Surveys are now being made and construction will be started early next season.

The City Engineering Department of New Orleans, La., has completed plans for paving 20 streets in 1916, at an estimated cost of $1,500,000. This is only a portion of the work contemplated for next year.

A Paved Highway From Palestine to Houston, Tex., is contemplated by the citizens of the counties along the proposed road. The project will be developed at a meeting to be held July 4 at Trinity, Tex.

The Chamber of Commerce of Bayonne, N. J., is urging the construction of a bridge across Newark Bay between Bayonne and Elizabeth, N. J. The proposed structure would cost $600,000, according to estimates.

The Board of County Commissioners of Manatee County, Fla., has set July 19 as the date of an election on a bond issue of $140,400 for highway and bridge improvements in the Parrish road and bridge district.

A Good Roads Association has been formed to stimulate interest in a road bond issue for the northern part of Atascosa County, Tex. Officers are J. H. English, President; S. L. Langley, Secretary and A. E. Newman, Treasurer.

The McNichol Paving & Construction Co., Philadelphia, Pa., was the low bidder for the improvement of the Northeast Boulevard, Philadelphia. The bid was $285,546 while the amount appropriated for the work was $400,000.

The Lufkin-Livingston-Houston Highway Association was organized recently at Livingston, Tex. Officers are as follows: President, C. U. McDowell, Houston; Secretary, W. L. West, Livingston; Treasurer, W. M. Glenn, Lufkin.

Volusia County, Fla., has voted to issue $400,000 worth of road bonds in District No. 4. Districts Nos. 1 and 2 will vote on an issue of $425,000 on July 13. It is proposed to build over 100 miles of roads during next year.

Eighty-five per cent. of the Iowa Automobile Tax has been distributed among the counties of the state, in accordance with the law which went into effect on May 8. The amount distributed was $693,346. The next distribution will take place on August 1 at which time the counties will divide 90 per cent.

The County Road Commissioners of Hamilton County, Tenn., have awarded a contract to the McIsaac-Gentry Co., of Chattanooga, Tenn., for the construction of the Wauhatchie Turnpike over the point of Lookout Mountain. The company's bid was $100,795.97.

Construction Work on the New Bridge across tne Colorado River at Needles, Cal., will be done under the direction of the Board of Supervisors of San Bernardino County, Cal. The bridge will be 836 ft. long and will cost approximately $90,000. The cost will be borne by the Government, the States of Arizona and California and the California Counties of San Bernardino and Los Angeles.

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